1999 Toxics Use Reduction Information Release

Spring 2001

10 Years of Toxics Use Reduction

Commonwealth of Massachusetts
Department of Environmental Protection

Developed in conjunction with:
Office of Technical Assistance for Toxics Use Reduction
Toxics Use Reduction Institute
Executive Office of Environmental Affairs

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Acknowledgments

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Others that supported the preparation of this report include: Glenn Keith and William McGovern of the Department of Environmental Protection; Kenneth Geiser of the Toxics Use Reduction Institute; Paul Richard of the Office of Technical Assistance; Regina McCarthy of the Executive Office of Environmental Affairs (EOEA); and David Lutes of the EOEA Administrative Council on Toxics Use Reduction.

The photos in this report are examples of TURA filers who have successfully demonstrated toxics use reduction.

Executive Summary

In the decade since the Commonwealth enacted the Toxics Use Reduction Act (TURA), manufacturers and other businesses statewide have reduced their reliance on toxic chemicals dramatically, making Massachusetts the national leader in demonstrable reductions in toxic chemical use and providing clear evidence that the state has made tremendous progress in pollution prevention.

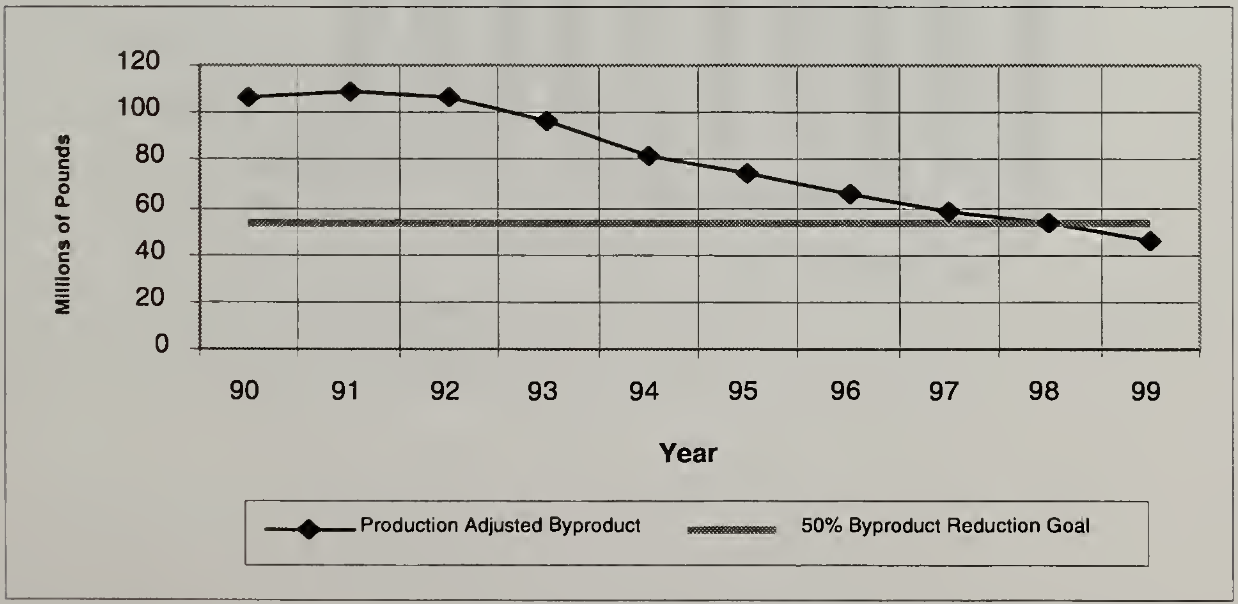
One of TURA's original goals was to reduce the generation of toxic waste by 50%. That goal has now been met: between 1990 and 1999, Massachusetts TURA facilities decreased their waste generation by 57 percent. They also decreased their total chemical use by 41 percent, and their toxic releases to the environment by 87 percent. This data has been adjusted to account for a 52 percent increase in production since 1990. [1]

The dramatic achievements of the TURA program could not have been made possible without the efforts of Massachusetts industry working with state government to implement the goals of the TURA program. Massachusetts facilities have reduced significant amounts of waste by implementing toxics use reduction techniques, including input substitution, production unit modernization, production unit redesign, improved operation and maintenance, and recycling and reuse of chemicals into their production processes. They have demonstrated that toxics use reduction not only reduces toxic chemical use and waste, but also saves Massachusetts businesses money over the long term.

A Decade of Progress

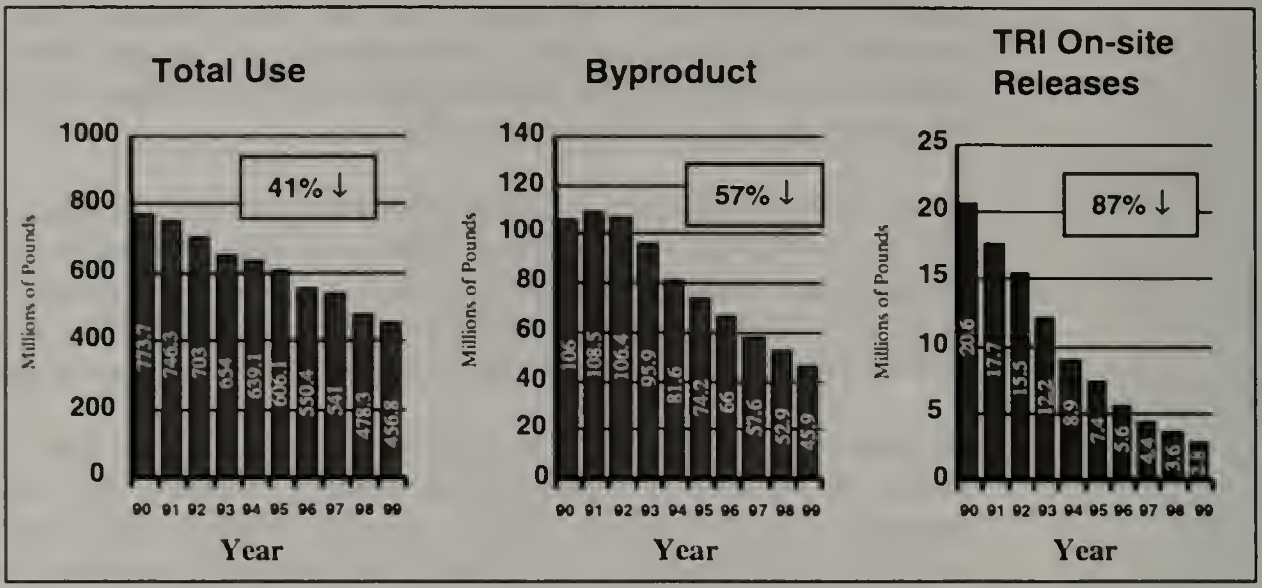
The overall progress of the TURA program is best reflected by toxics use reduction progress within the Core Group of TURA filers. The Core Group consists of industries and chemicals that have been subject to yearly reporting since 1990. Using production adjusted data, from 1990 to 1999, Core Group filers reduced their byproduct (or waste) by 60 million pounds or 57%, exceeding the 50% byproduct reduction goal established by TURA (see Figure 1). Core Group filers also reduced their toxic chemical use by 317 million pounds or 41%, and their on-site releases of toxic chemicals to the environment by 18 million pounds or 87% (see Figure 2).

Figure 1 - Core Group Byproduct Reduction (1990-1999)



[1] The 50% goal has been consistently interpreted as taking into account changes in levels of production.

Figure 2 – Core Group Toxics Use Reduction Progress From 1990 to 1999 – Production Adjusted



Even when Core Group data is not adjusted for the 52% increase in production reported by these facilities between 1990 and 1999, Core Group filers still decreased their total use of reportable chemicals by 10% (from 773.7 million pounds in 1990 to 692.4 million pounds in 1999), reduced their byproduct generation by 34% (from 106.2 million pounds in 1990 to 69.6 million pounds in 1999), and reduced their on-site releases to the environment by 80% (from 20.6 million pounds in 1990 to 4.2 million pounds in 1999). This represents significant progress since there has been decreasing toxic chemical use and waste despite substantial increases in production due to economic growth.

I. TURA Progress 1990-1999

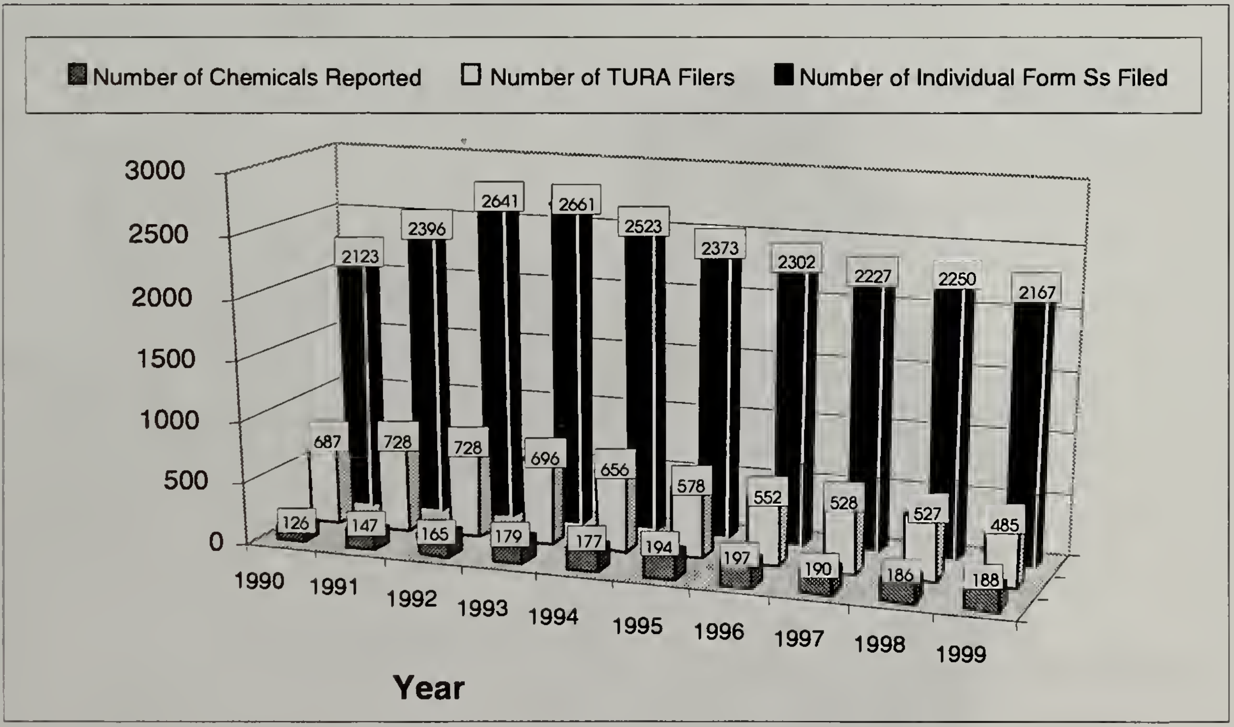
Since 1990, when the TURA program began, Massachusetts TURA filers have made substantial progress in reducing their use of toxic substances and their generation of toxic byproducts. In measuring this progress, a number of changes in the TURA reporting universe must be taken into account.

In 1990, only manufacturing firms were required to report to the TURA program. Then, in accordance with TURA's phase-in schedule, the reporting universe was expanded to include industries beyond the manufacturing sector. The list of chemicals subject to reporting also was expanded in reporting years 1991, 1992, and 1993, further enlarging the universe of companies reporting. In addition, over the years, certain chemicals have been delisted. Most recently, the Administrative Council on Toxics Use Reduction delisted pure copper, in solid or molten metal form, effective reporting year 1999.

Figure 3 illustrates TURA filing trends over the past ten years. Out of 1,420 chemicals regulated under TURA, only 188 were reported in 1999. This compares to a high of 197 chemicals reported in 1996.

The number of facilities reporting under TURA has declined over time, from a high of 728 facilities in 1991 and 1992, to 485 in 1999. The number of individual Form Ss declined from a high of 2,661 in 1993 to 2,167 in 1999.[2]

Figure 3 - TURA Filer Trends 1990 –1999

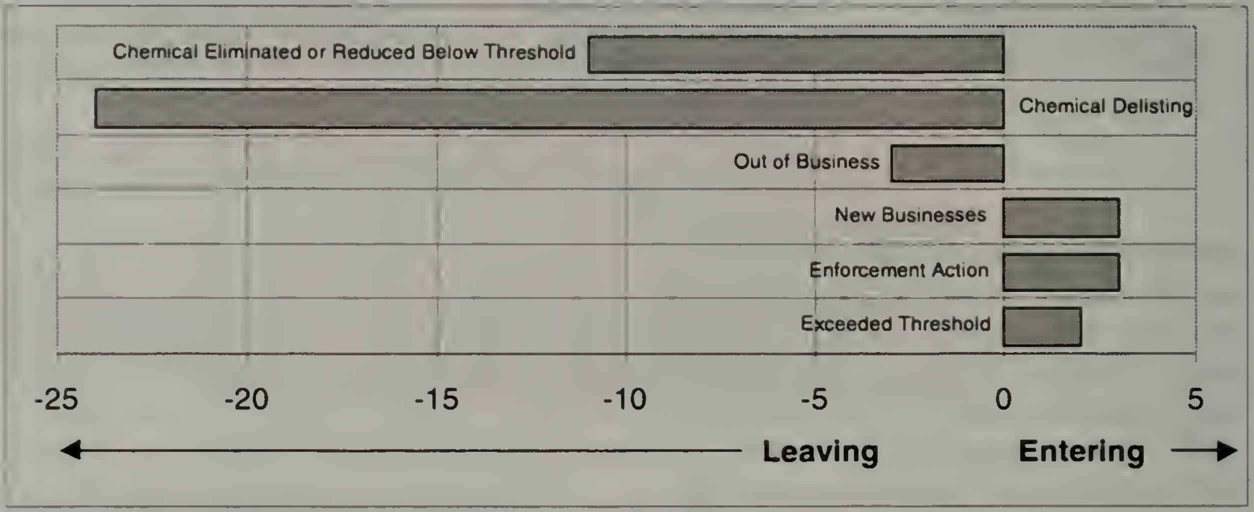


[2] A separate Form S is required for each chemical reported by a facility.

In 1999, 36 filers left the TURA reporting universe and 11 entered the reporting universe, for a net decrease of 26 filers (see Figure 4). Three new filers were new businesses, two new filers were existing businesses but began using chemicals above the reporting threshold, and three new filers were businesses that should have previously reported and began reporting in 1999 due to DEP enforcement actions.

Twenty-two filers left the reporting universe in 1999 due to the delisting of copper. Eleven filers left the reporting universe due to the elimination of a chemical in the production process or the reduction of the use of the chemical below the reporting threshold. Three filers left due to a closure of manufacturing operations.

Figure 4 – Reasons for Filers Entering and Leaving Reporting Universe in 1999



(M/A/COM, a Tyco Company, Lowell) M/A-COM Incorporated of Lowell produces semiconductor products for the communications industry. Their products include discrete diodes, transistors, power devices, MMICs, ASIC chip sets and various other electronic components and devices. M/A-COM has carried out trials on powder paint coating applications in an effort to reduce the use of conventional solvent-based paint and other surface finishes. The conversion to powder coatings could significantly reduce the VOC emissions that result from traditional solvent-based painting operations.

Core Group Progress

The overall progress of the TURA program is best reflected by toxics use reduction progress within the Core Group of TURA filers. In order to allow for a consistent picture of TURA progress, a Core Group has been defined, consisting of industries and chemicals that were subject to reporting in 1990 and which remain subject to reporting in 1999. The Core Group includes any facility whose Standard Industrial Classification (SIC) code is within the manufacturing SIC codes (20 to 39, inclusive), and all chemicals in the 1990 TURA reporting list that have not since been delisted. The criteria for inclusion in the Core Group do not change. However, there are yearly changes in the Core Group due to chemical delistings and new filers. The following rules apply to the Core Group data:

- If a chemical is delisted, it is removed from the Core Group for all reporting years.
- New filers are included in the Core Group if their SIC codes and chemicals meet the Core Group criteria.
- If a Core Group facility drops below the reporting threshold, its prior year records remain in the Core Group.
- The Core Group does not include chemicals for which a facility claimed trade secret protection in any year.

The Core Group included 347 (or 72%) of the total number of facilities reporting in 1999 (see Figure 5). The Core Group used 692 million pounds (or 64%) of the total toxic chemicals reported in 1999 (see Figure 6).

Figure 5 – Number of Facilities: Core Group vs. All TURA Filers

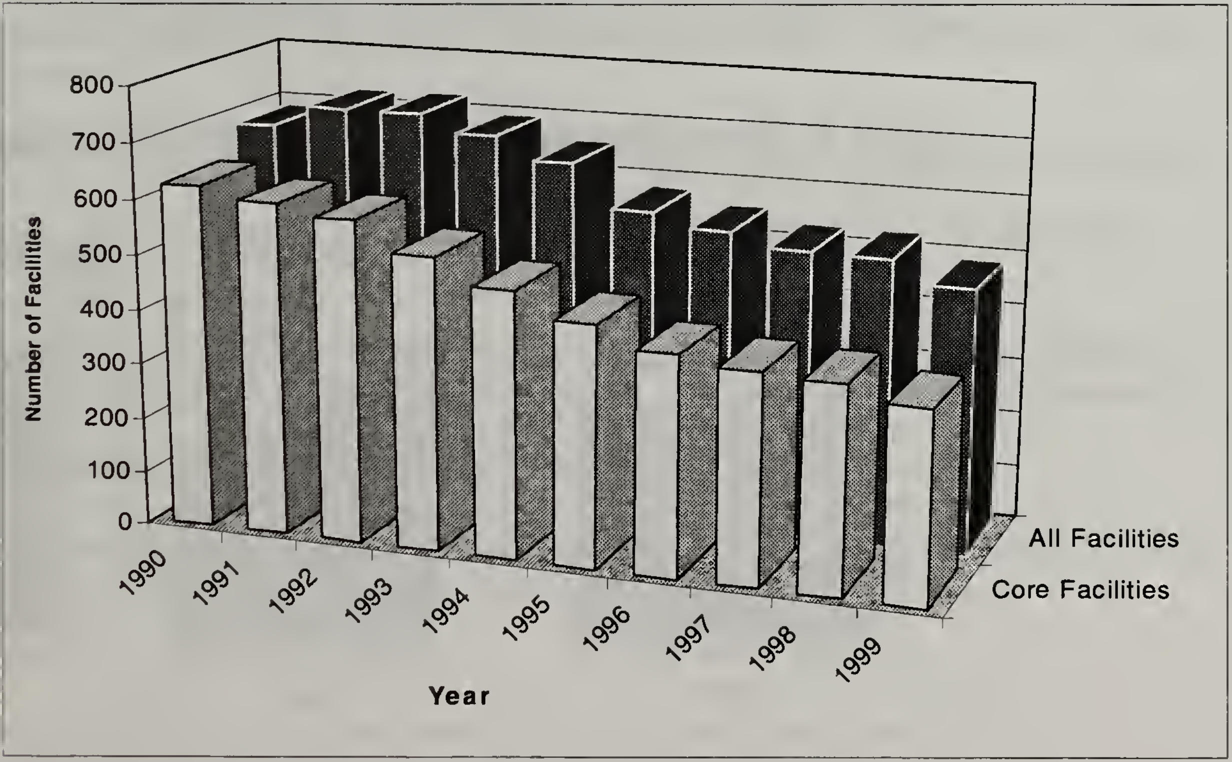
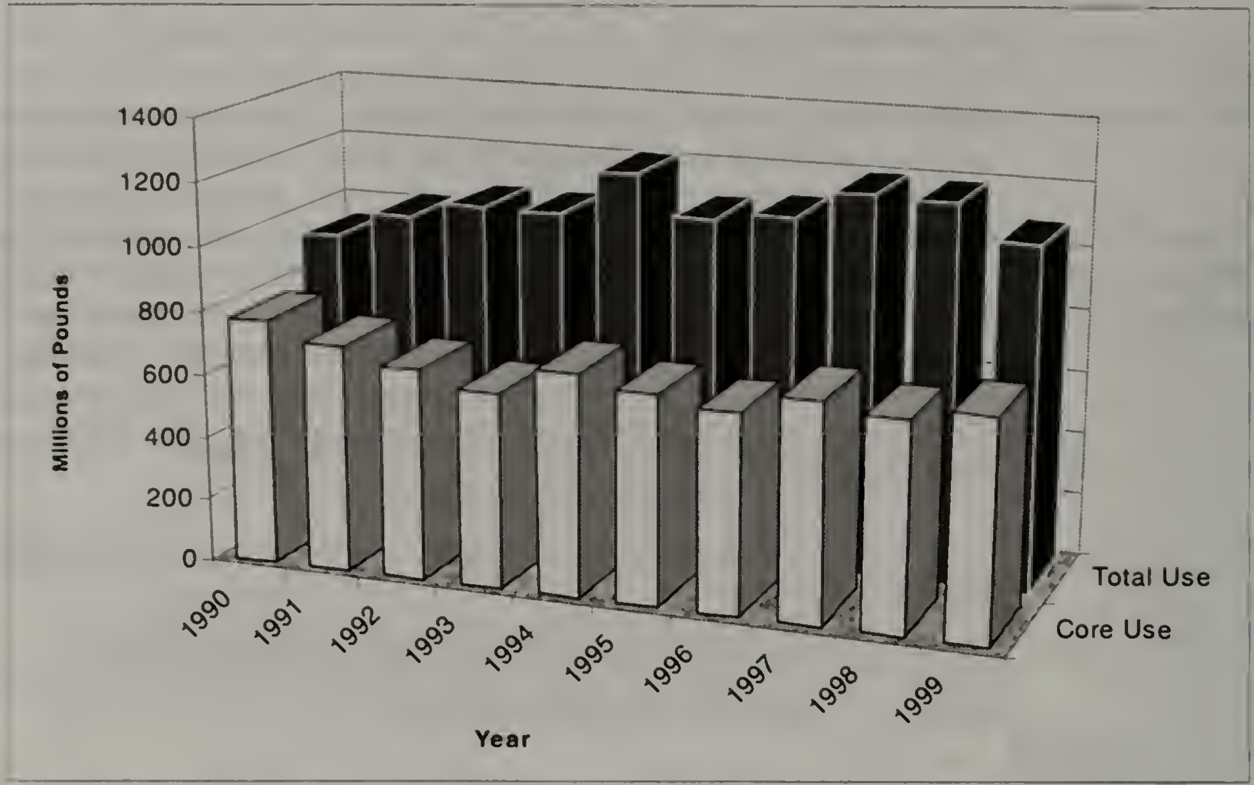


Figure 6 – Amount of Total Use: Core Group vs. All TURA Filers

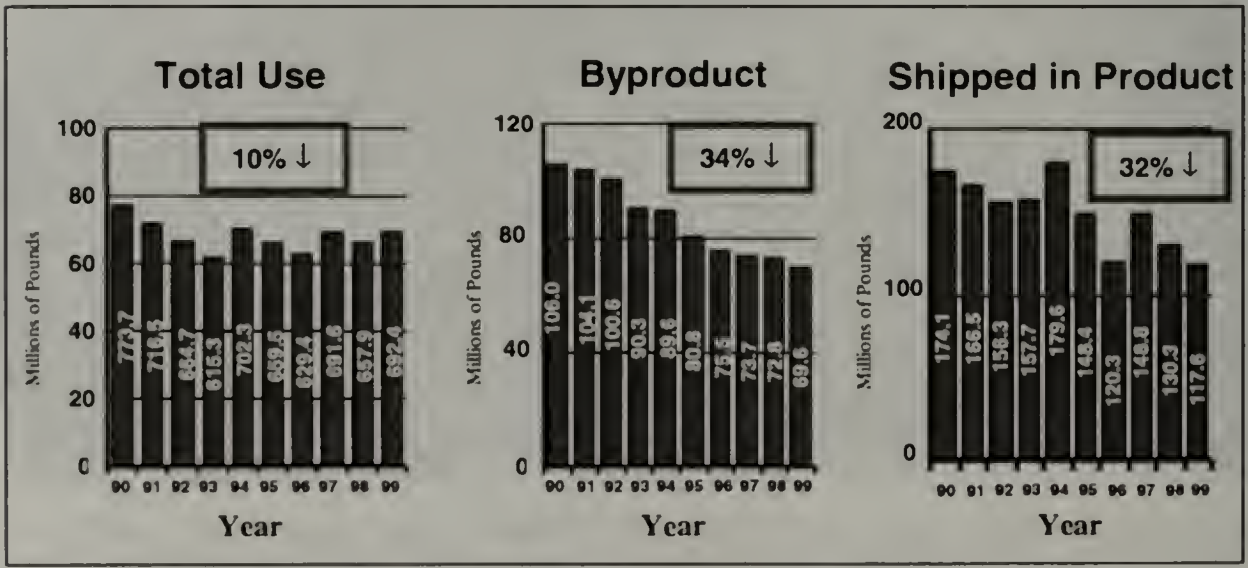


Core Group Progress – Without Adjusting for Production

The changes in total reported Core Group quantities over the period 1990 to 1999 are shown in Figures 7 and 8. These figures report raw data, which has not been adjusted for changes in production.

From 1990 to 1999, Core Group filers decreased their total chemical use by 10%, from 773.7 million pounds in 1990 to 692.4 million pounds in 1999. Core Group filers reduced their byproduct generation by 34%, from 106.0 million pounds in 1990 to 69.6 million pounds in 1999. Core Group filers reduced the quantity of chemicals shipped in product by 32%, from 174.1 million pounds in 1990 to 117.6 million pounds in 1999.

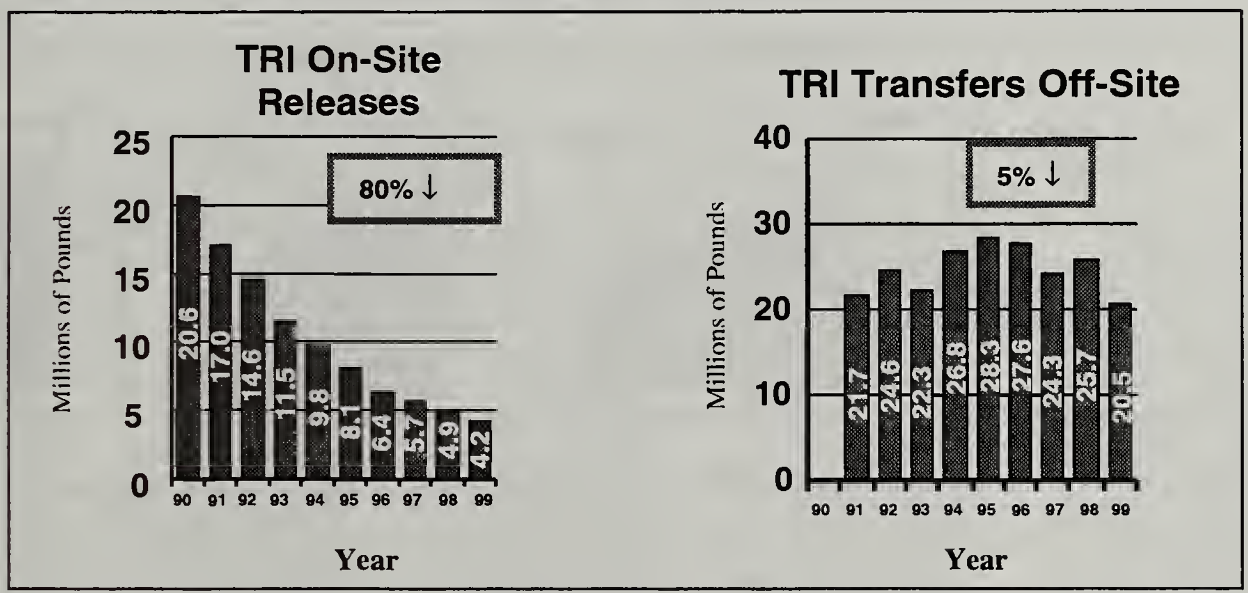
Figure 7 – Core Group Quantities 1990 –1999 (not production adjusted)



Core Group filers also have been very successful in achieving reductions of on-site releases as defined by the federal Toxics Release Inventory (TRI) program. These releases have been reduced by 80%, from 20.6 million pounds in 1990 to 4.2 million pounds in 1999.

Finally, Core Group filers reduced their TRI transfers off-site[3] (byproducts that are transferred off-site for energy recovery, recycling, treatment and disposal) by 5%, from 21.7 million pounds in 1991 to 20.5 million pounds in 1999.

Figure 8 – Core Group Quantities 1990-1999 (not production adjusted)



Core Group Progress - Production Adjusted Data

Between 1990 and 1999, Core Group filers reported a 52% increase in production. In order to more accurately measure progress, the TURA data is adjusted to eliminate the effects of changes in production by using production ratios reported by the Core Group facilities.

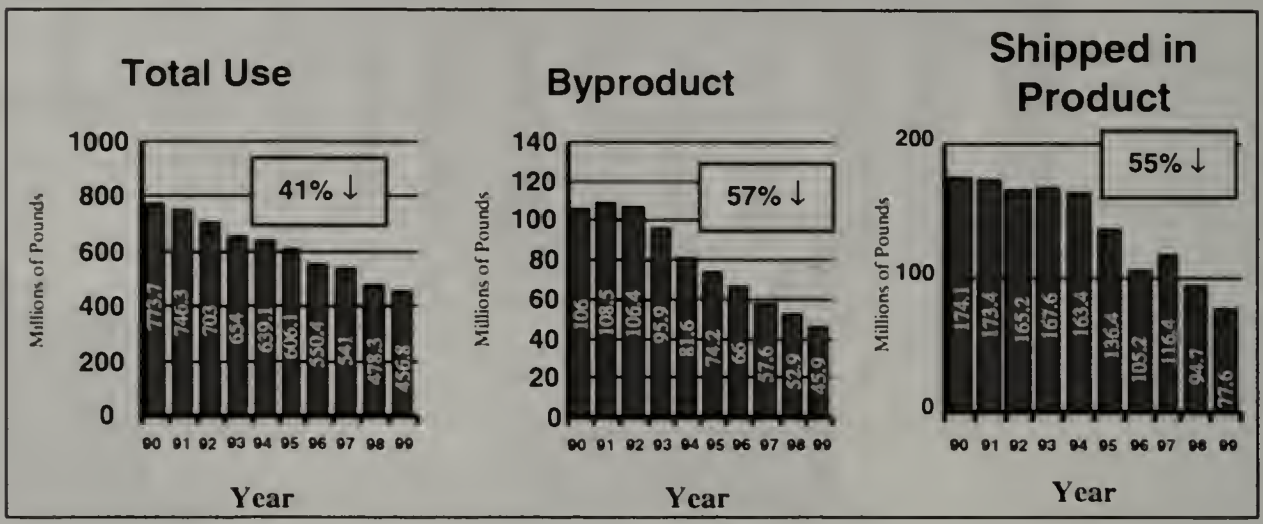
The following example illustrates how data is adjusted to reflect changes in production:

- A facility produces 1,000 machine parts, and generates 100 lbs. of byproduct in year 1.
- In year 2, the facility produces 25% more machine parts (1,250). Therefore, the production ratio is 1.25. However, assume it still generates 100 lbs. of byproduct.
- The production adjusted byproduct for year 2 is 100 lbs./1.25 = 80 lbs.
- The production adjusted percent change from year 1 to year 2 is [100-80]/100 = 0.20, or a 20% reduction, while its actual byproduct reduction is 0%.

[3] Trends are measured from 1991 due to a change in the definition of Transfers Off-Site that year.

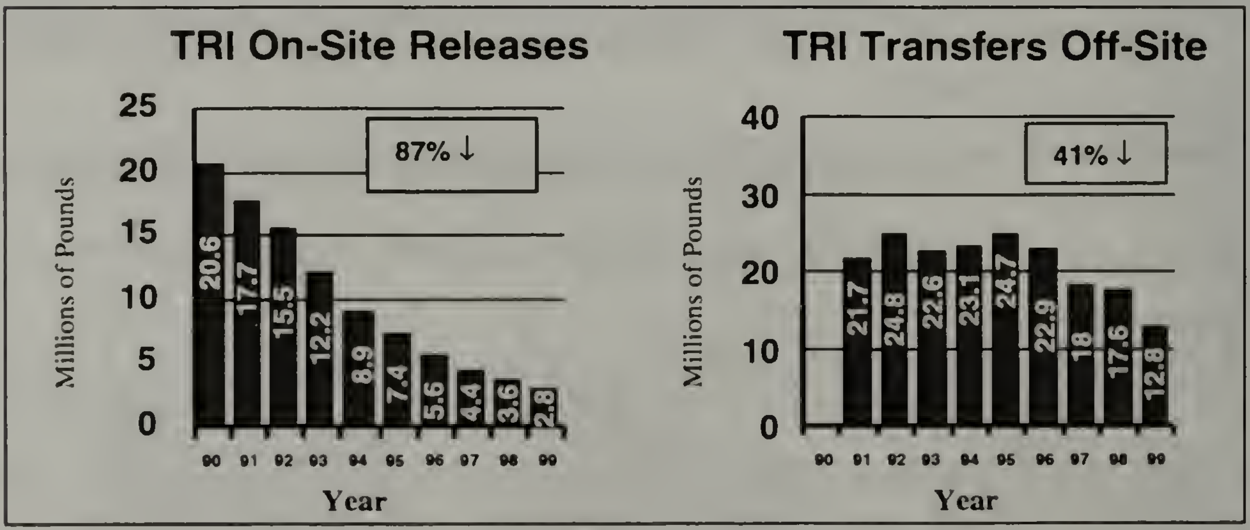
When the Core Group data is adjusted to account for changes in production since 1990 (see Figures 9 and 10), Core Group filers have reduced their toxic chemical use by 41%, have generated 57% less byproduct, and have shipped 55% fewer chemicals in product.

Figure 9 – Core Group Quantities (production adjusted)



Core Group filers also have reduced their TRI on-site releases by 87%, and have reduced their TRI transfers off-site by 41%.[4]

Figure 10 - Core Group Quantities (production adjusted)



[4] Trends are measured from 1991 due to a change in the definition of transfers off-site that year.

Table 1 summarizes TURA data from 1990 to 1999, showing both **reported** and **production adjusted** quantities. The production adjusted numbers are adjusted to the base year production levels, thus providing a production-level comparison of current quantities to base year quantities.

Table 1- Core TURA Data: 1990 - 1999 Trend Summary *
(Does Not Include Trade Secret Quantities)
Quantities are in Millions of Pounds

	Total Use		Byproduct		Shipped In Product		TRI On-Site Releases		TRI Transfers Off-Site		TRI Activity Index[5]
1990	773.7	773.7	106.0	106.0	174.1	174.1	20.6	20.6			
1991	716.5	746.3	104.1	108.5	166.5	173.4	17.0	17.7	21.7	21.7	0.96
1992	664.7	703.0	100.6	106.4	156.3	165.2	14.6	15.5	24.6	24.8	0.99
1993	615.3	654.0	90.3	95.9	157.7	167.6	11.5	12.2	22.3	22.6	1.00
1994	702.3	639.1	89.6	81.6	179.6	163.4	9.8	8.9	26.8	23.1	1.17
1995	659.5	606.1	80.8	74.2	148.4	136.4	8.1	7.4	28.3	24.7	0.99
1996	629.4	550.4	75.5	66.0	120.3	105.2	6.4	5.6	27.6	22.9	1.05
1997	691.6	541.0	73.7	57.6	148.8	116.4	5.7	4.4	24.3	18	1.12
1998	657.9	478.3	72.8	52.9	130.3	94.7	4.9	3.6	25.7	17.6	1.08
1999	692.4	456.8	69.6	45.9	117.6	77.6	4.2	2.8	20.5	12.8	1.10
Percent Change 1990-1999	10% Reduction	41% Reduction	34% Reduction	57% Reduction	32% Reduction	55% Reduction	80% Reduction	87% Reduction	5% Reduction	41% Reduction	52% Increase

* Note: Quantities in shaded boxes are production adjusted.

5 A ratio of reporting production by comparing current year to prior year production.

II. 1999 TURA Chemical Data

In 1999, TURA filers manufactured, processed, or otherwise used 1.4 billion pounds of chemicals. TURA defines these terms as follows:

Manufacture – "to produce, prepare, import or compound a toxic or hazardous substance" (e.g., intentional manufacture of a metal compound or the unintentional manufacture of hydrochloric acid during combustion of fossil fuels).

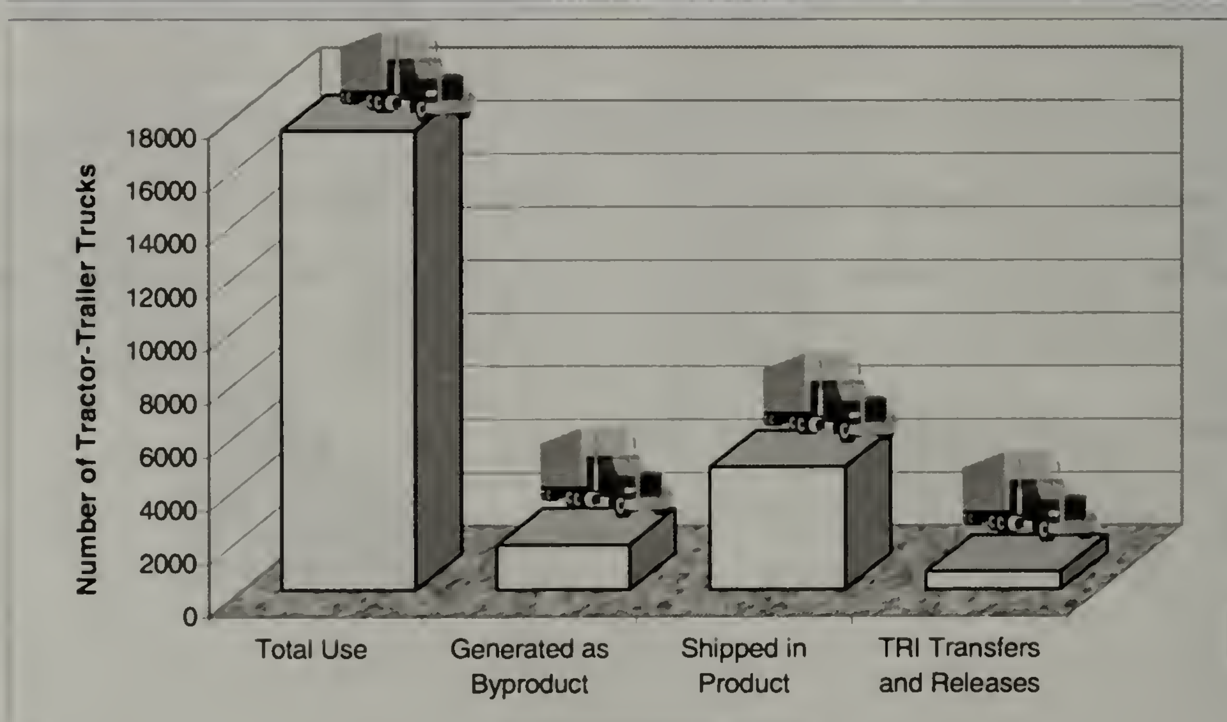
Process – "the preparation of a toxic or hazardous substance, including without limitation, a toxic substance contained in a mixture or trade name product, after its manufacture, for distribution in commerce" (e.g., in the formulation of paints or coatings, any listed toxics are "processed;" in the manufacture of polystyrene, the styrene monomer is "processed").

Otherwise Use – "any use of a toxic substance that is not covered by the terms manufacture or process and includes use of a toxic substance contained in a mixture or trade name product" (e.g., chemicals used to clean parts).

Figure 11 summarizes the 1999 data for all TURA filers. These companies reported using almost 1.4 billion pounds of chemicals and generating 135 million pounds of waste.

Figure 11 - How many Tractor-Trailer Trucks would you need to haul...

*Total Use = 1,381,000,000 lbs. = 17,263 Tractor-Trailer Trucks
*Total Generated as Byproduct = 135,000,000 lbs. = 1,688 Tractor-Trailer Trucks
*Total Shipped in Product = 370,000,000 lbs. = 4,625 Tractor-Trailer Trucks
*TRI on-site and Transfers Off-Site = 53,000,000 lbs. = 663 Tractor-Trailer Trucks



*Calculated assuming a tractor-trailer truck carries 80,000 lbs.

Manufactured Chemicals

Figure 12 shows that relatively little manufacturing of TURA chemicals occurs in Massachusetts. Chemicals reported as "manufactured" accounted for only 6% of the total use statewide, or 65 million pounds. A significant amount of the chemicals reported as manufactured are not manufactured intentionally, but are produced as a byproduct of

some other activity. Examples include the production of nitrate compounds as a result of wastewater treatment and the creation of acid gases and polycyclic aromatic compounds from fuel combustion for power generation.

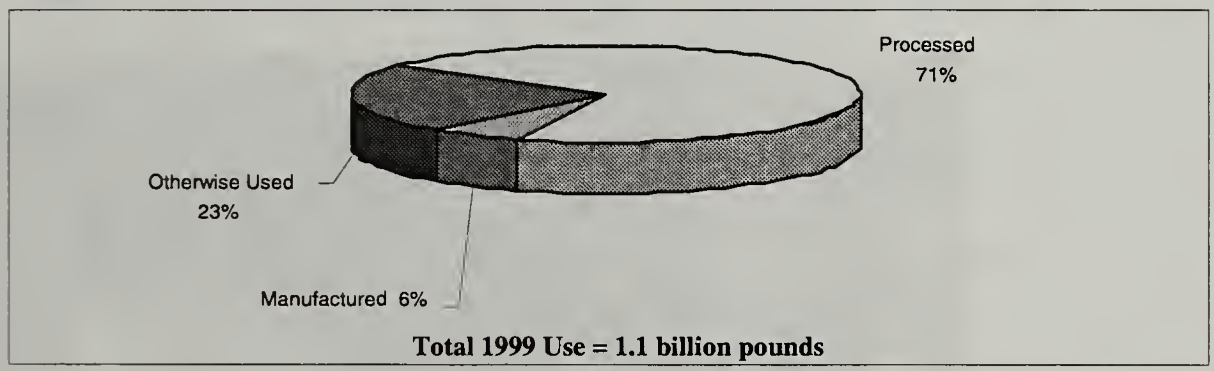
Processed Chemicals

In Massachusetts, the predominant chemical use is "processing," which includes incorporating a listed chemical into a product. Processing of chemicals accounted for 71% of total use (or 767 million pounds). Styrene, which is used in the production of plastics, accounted for 50% (or 388 million pounds) of total chemicals processed.

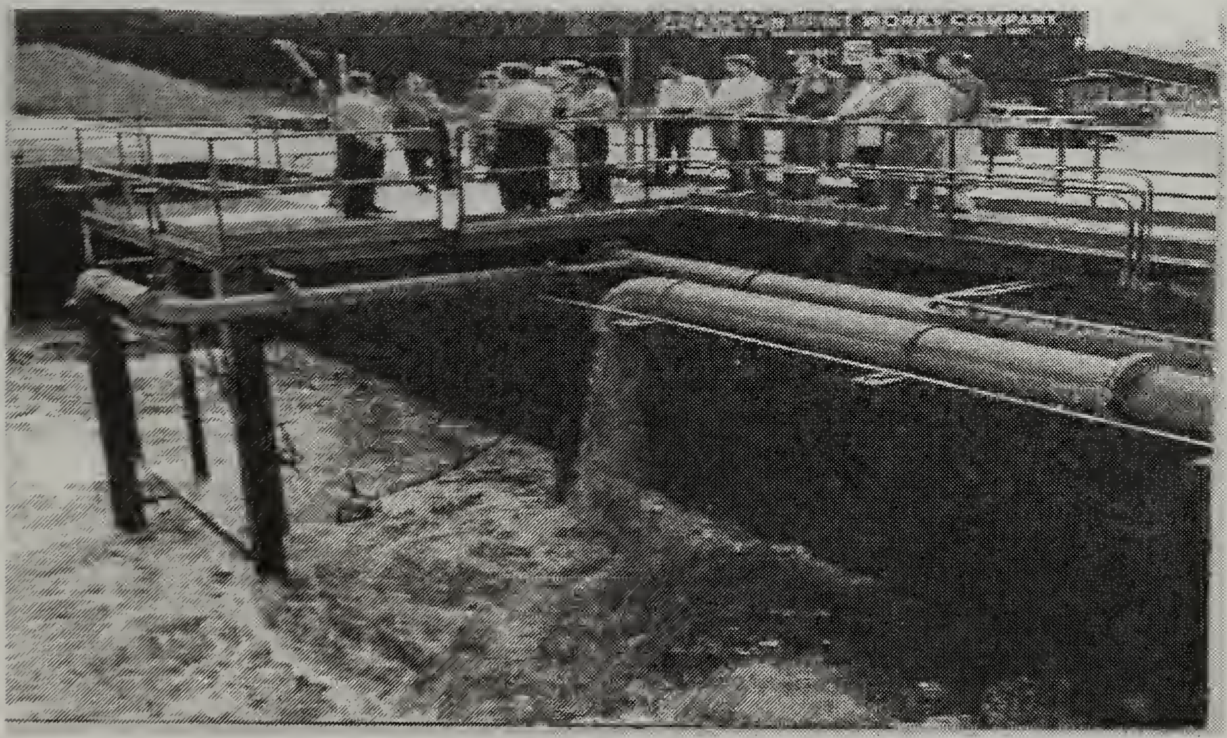
Otherwise Used Chemicals

Chemicals "otherwise used" accounted for 23% of total use (or 251 million pounds). Chemicals otherwise used include activities such as parts cleaning and waste treatment.

Figure 12 – 1999 Chemical Use (does not include trade secret data) *



* In this Report, when total use is broken down by type of use (i.e., manufactured, processed, or otherwise used), trade secret data is not included. Thus, the total use is 1.1 billion pounds, rather than 1.4 billion pounds (which includes trade secret data).



(Cranston Print Works, Webster) As part of its commitment to continuous process improvement, Cranston Print Works has used toxics use reduction to reduce environmental impacts, improve occupational safety, and reduce operational costs. Implementation of in-process acid recycling, process control charting, and carbon dioxide treatment of wastewater has resulted in a 430,000 lbs./year reduction in the use of acetic acid and the complete elimination of 2.7 million lbs./year of sulfuric acid.

Top 20 Chemicals

In 1999, 188 chemicals were reported out of 1,420 TURA-listed chemicals. Of the 188, 20 chemicals accounted for 79% of the total use reported statewide, or 858 million pounds (not including trade secret information) (see Table 2). The top 20 chemicals generated as byproduct in 1999 accounted for 74% of the total byproduct generated statewide (see Table 2), or 96 million pounds. Styrene monomer was the most used reported chemical in 1999, accounting for 36% of total use reported (or 388 million pounds). Styrene monomer is the building block for various plastics.

Sodium hydroxide was the second most used chemical in 1999, accounting for 6% of total reported use. Sodium hydroxide has a wide range of uses, from parts cleaning to wastewater treatment. More facilities used sodium hydroxide than any other TURA chemical. Of the 485 facilities that reported, 219 (or 45%) reported using sodium hydroxide. Sodium hydroxide also had the highest byproduct amount reported statewide. Sulfuric acid was the second highest in byproduct generation, and also was the second most commonly used reported chemical, with 150 facilities (or 25%) reporting its use.

(Acushnet Rubber, New Bedford) Acushnet Rubber Company, Inc. designs and manufactures elastomeric products serving several industrial markets such as automotive, safety, electrical and office machinery. Acushnet Rubber was the first company in Massachusetts to obtain certification in ISO 14001, an international standard for environmental management systems.

Table 2 - 1999 Top 20 Chemicals

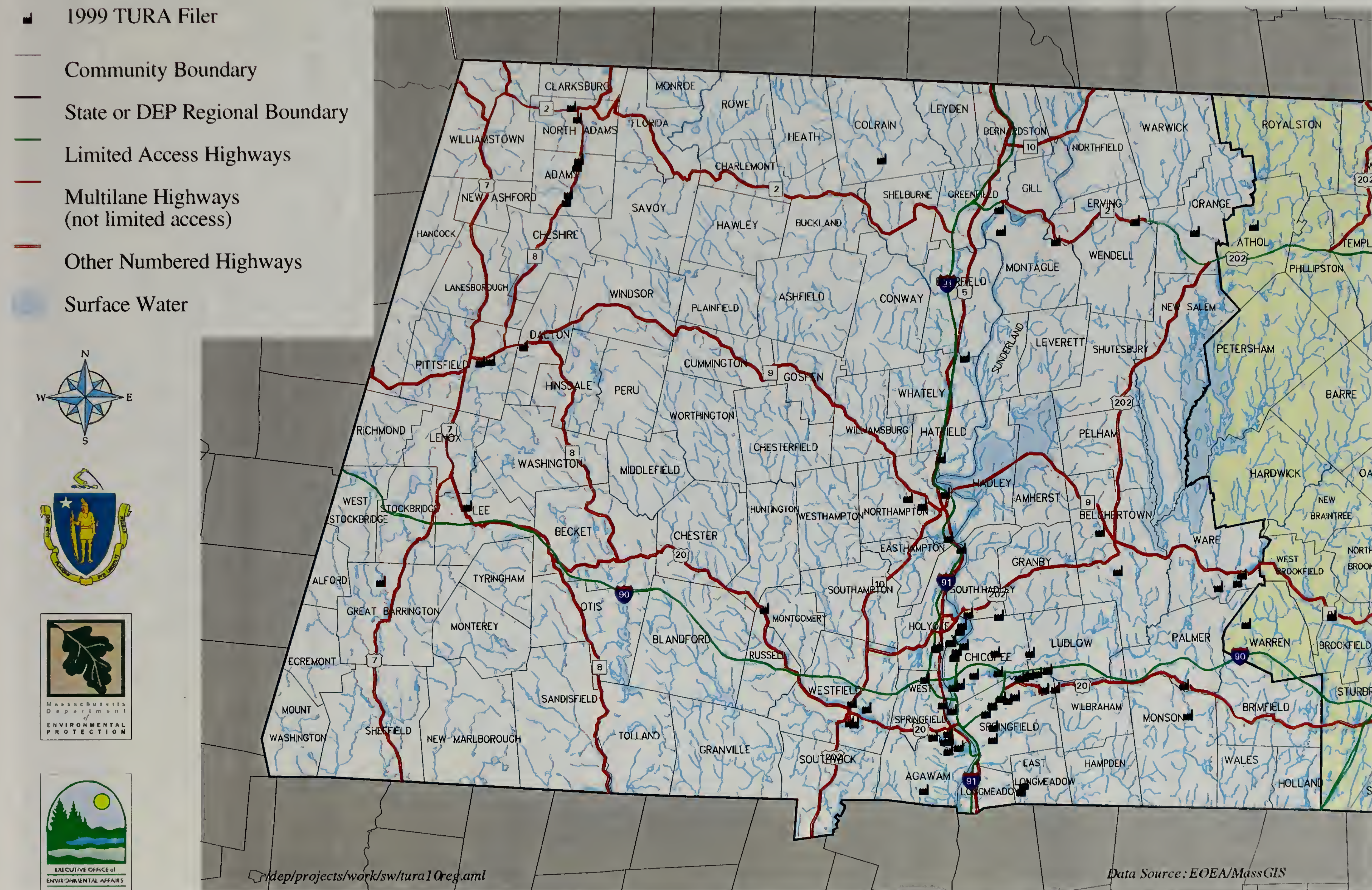
Total Use *These quantities do not include Trade Secret*		**Byproduct Generation** *These quantities include Trade Secret*	
Chemical Name (CAS #)	**Total Use (Lbs.)**	**Chemical Name (CAS #)**	**Byproduct Generation (Lbs.)**
Styrene (100425)	387,596,218	Sodium Hydroxide (1310732)	15,531,628
Sodium Hydroxide (1310732)	89,651,307	Sulfuric Acid (7664939)	13,601,525
Hydrochloric Acid (7647010)	49,977,969	Toluene (108883)	12,637,828
Sulfuric Acid (7664939)	43,916,422	Ethyl Acetate (141786)	11,072,459
Methanol (67561)	40,205,809	Acetone (67641)	8,410,575
Polycyclic Aromatic Compounds (1040)	37,370,811	Methyl Ethyl Ketone (78933)	7,597,346
Toluene (108883)	33,938,650	Methanol (67561)	6,299,549
Potassium Hydroxide (1310583)	19,289,024	Hydrochloric Acid (7647010)	6,021,125
Methyl Ethyl Ketone (78933)	16,795,597	Nitrate Compounds (1090)	5,768,606
Sodium Hypochlorite (7681529)	16,668,427	Copper Compounds (1015)	4,152,989
Zinc Compounds (1039)	16,116,293	Acetic Acid (64197)	3,771,319
Phthalic Anhydride (85449)	15,234,863	Nitric Acid (7697372)	3,195,216
Acetone (67641)	13,962,751	Ethylene Glycol (107211)	2,854,088
Ammonia (7664417)	12,549,393	Ammonia (7664417)	2,669,210
Ethyl Acetate (141786)	11,775,428	Formaldehyde (50000)	2,256,239
Ethylene Glycol (107211)	11,351,502	n-Butyl Alcohol (71363)	2,131,597
Copper Compounds (1015)	11,114,015	Phosphoric Acid (7664382)	2,055,777
Copper (7440508)	11,047,394	Sodium Hypochlorite (7681529)	1,908,864
Phosphoric Acid (7664382)	10,632,148	Potassium Hydroxide (1310583)	1,698,093
Lead Compounds (1026)	9,042,001	Dichloromethane (75092)	1,654,867
The following four chemicals appear in the top 20 chemicals total use list (above) when trade secret quantities are included: Butyl Acrylate, Butyraldehyde, Formaldehyde, Vinyl Acetate.			

Table 3 shows the top 20 chemicals shipped in product in 1999, which totaled 204 million pounds (or 65%) of the total shipped in product. Sodium hydroxide and methanol were the predominant chemicals shipped in product. Table 3 also shows the top 20 chemicals released and transferred, which totaled 43 million pounds (or 81%) of the releases and transfers reported statewide. Nitrate compounds and copper compounds were the predominant chemicals released and transferred.

Table 3 - 1999 Top 20 Chemicals

Shipped in Product *These quantities do not include Trade Secret*		TRI Releases and Transfers *These quantities include Trade Secret*	
Chemical Name (CAS #)	**Shipped in Product (Lbs.)**	**Chemical Name (CAS #)**	**Releases & Transfers (Lbs.)**
Sodium Hydroxide (1310732)	38,337,401	Nitrate Compounds (1090)	5,526,547
Methanol (67561)	34,524,576	Copper Compounds (1015)	3,961,226
Toluene (10883)	20,835,604	Hydrochloric Acid (7647010)	3,808,864
Potassium Hydroxide (1310583)	15,767,496	Toluene (108883)	3,680,809
Zinc Compounds (1039)	10,971,036	Methanol (67561)	3,100,831
Sodium Hypochlorite (7681529)	10,872,675	Ethylene Glycol (107211)	2,469,582
Copper (7440508)	10,335,634	Ethyl Acetate (141786)	2,438,812
Methyl Ethyl Ketone (78933)	8,917,277	Formaldehyde (50000)	2,255,709
Lead Compounds (1026)	8,320,922	Butyl Alcohol (71363)	2,038,352
Hexane (N-Hexane) (110543)	8,089,323	Dichloromethane (75092)	1,915,206
Chromium (7440473)	7,991,990	Acetone (67641)	1,911,004
Ethylene Glycol (107211)	7,565,344	Methyl Ethyl Ketone (78933)	1,541,246
Acetone (67641)	7,422,643	Zinc Compounds (1039)	1,271,728
Antimony Compounds (1000)	6,167,142	Nickel Compounds (1029)	1,244,160
Sulfuric Acid (7664939)	5,759,819	Ammonia (7664417)	1,214,889
Ammonium Hydroxide (1336216)	5,700,089	Sodium Hydroxide (1310732)	1,181,038
Formaldehyde (50000)	5,523,877	Lead Compounds (1026)	1,039,678
Copper Compounds (1015)	5,506,082	Sulfuric Acid (7664939)	920,320
Ammonia (7664417)	5,341,526	Copper (7440508)	656,273
Glycol Ethers (1022)	5,338,570	Trichloroethylene (79016)	635,992
The following chemical appears in the top 20 chemical shipped in product list (above) when trade secret quantities are included: Ethyl Acetate.			

1999 TURA Filers in Western Massachusetts



MASS GIS Massachusetts Geographic Information System
Massachusetts Executive Office of Environmental Affairs - 2001

DEP BWP Bureau of Waste Prevention

1999 TURA Filers in Central Massachusetts

1999 TURA Filer

Community Boundary

State or DEP Regional Boundary

Limited Access Highways

Multilane Highways (not limited access)

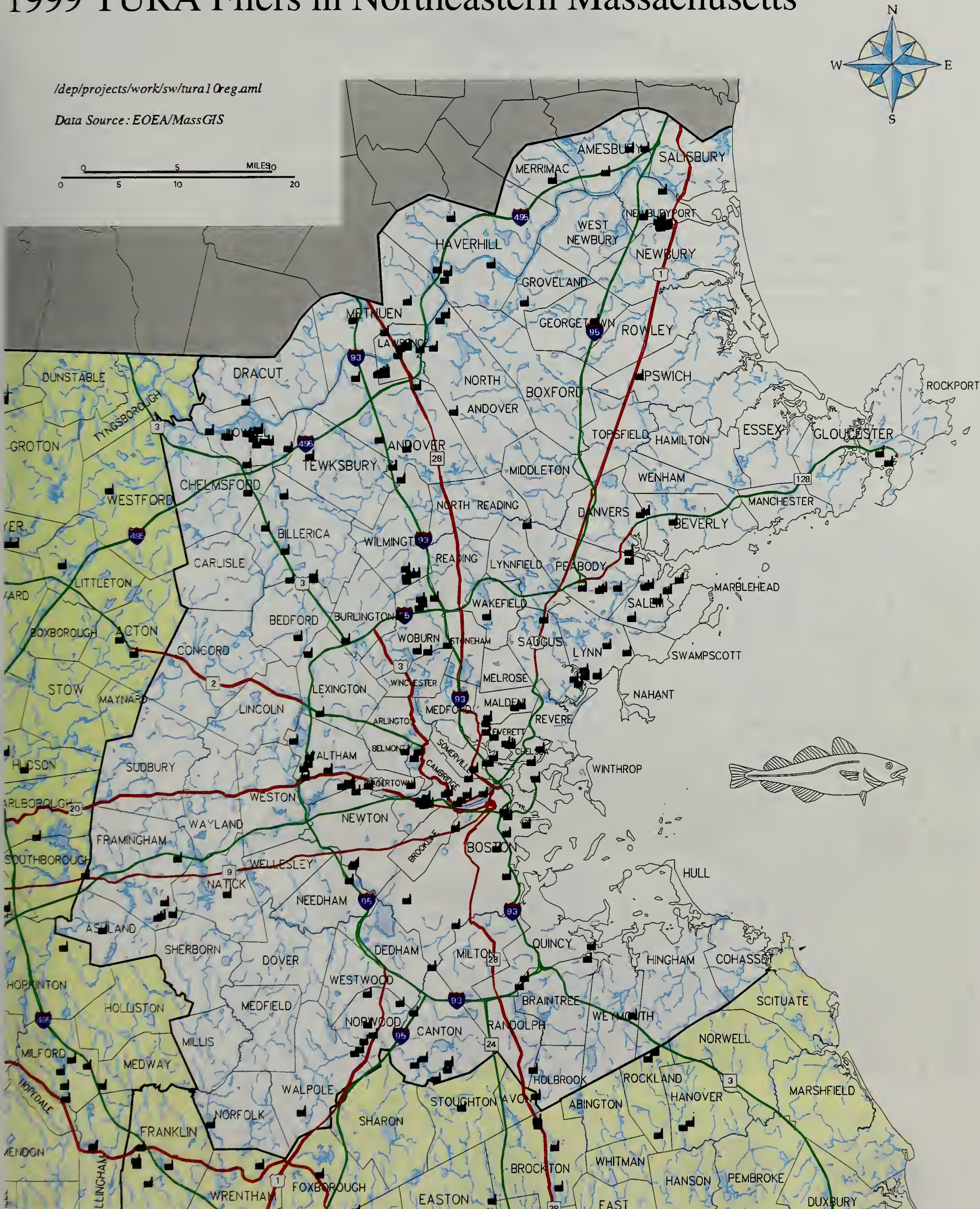
Other Numbered Highways

Surface Water

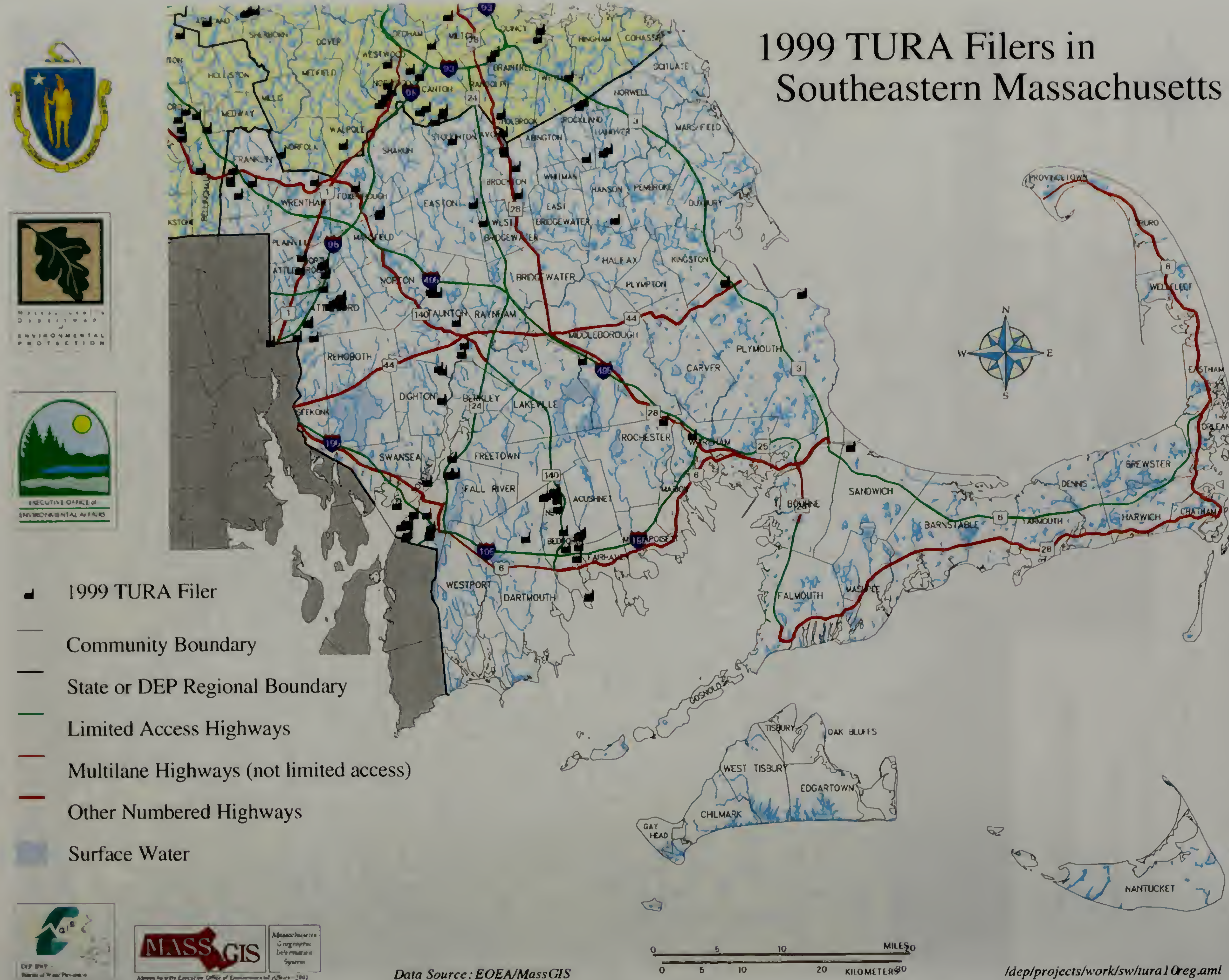
0 5 MILES 10

0 5 10 20

1999 TURA Filers in Northeastern Massachusetts



1999 TURA Filers in Southeastern Massachusetts



Data Source: EOEA/MassGIS

/dep/projects/work/sw/tura10reg.aml

III. 1999 Significant Industrial Sectors

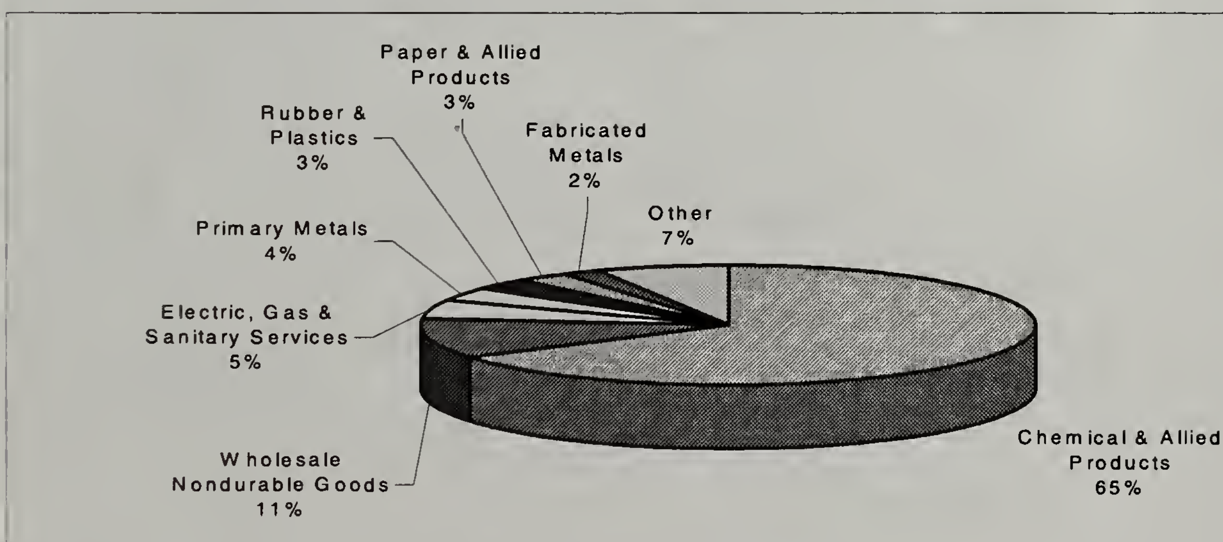
Under TURA, facilities in the Manufacturing Standard Industrial Classification (SIC) codes (20-39 inclusive) and those in SIC codes 10-14, 40, 44-51, 72, 73, 75 and 76, must report their chemical use if it exceeds certain thresholds.

Figure 13 shows chemical use by industrial sector. The Chemicals and Allied Products sector accounted for more than half (65%) of the statewide total chemical use (manufactured, processed, or otherwise used), and was the largest sector, with 91 reporting facilities. This sector is a diverse group of industries, and includes companies that manufacture or formulate adhesives, paints, pharmaceuticals, and plastic materials and resins. Approximately 45% of the total chemical use for this sector was attributable to the use of styrene monomer, which is used in the manufacture of polystyrene and other plastics.

The Wholesale Nondurable Goods sector was the second largest chemical user, accounting for 11% of total statewide use. The 11 firms reporting in this sector are primarily engaged in distribution of chemicals, medicines, paper, and clothing.

The Electric, Gas and Sanitary Services sector accounted for 5% of chemical use. The Primary Metals sector accounted for 4% of chemical use.[6] The Rubber and Plastics and the Paper and Allied Products sectors each accounted for 3% of chemical use. The Fabricated Metals sector accounted for 2% of chemical use, leaving the balance of statewide use (7%) to a variety of sectors.

Figure 13 – 1999 Chemical Use (by industrial sector)



[6] Primary metals accounted for 14% of use in 1998. The decrease in 1999 was due to the delisting of pure copper.

Figure 14 – 1999 Byproduct Generation (by industrial sector)

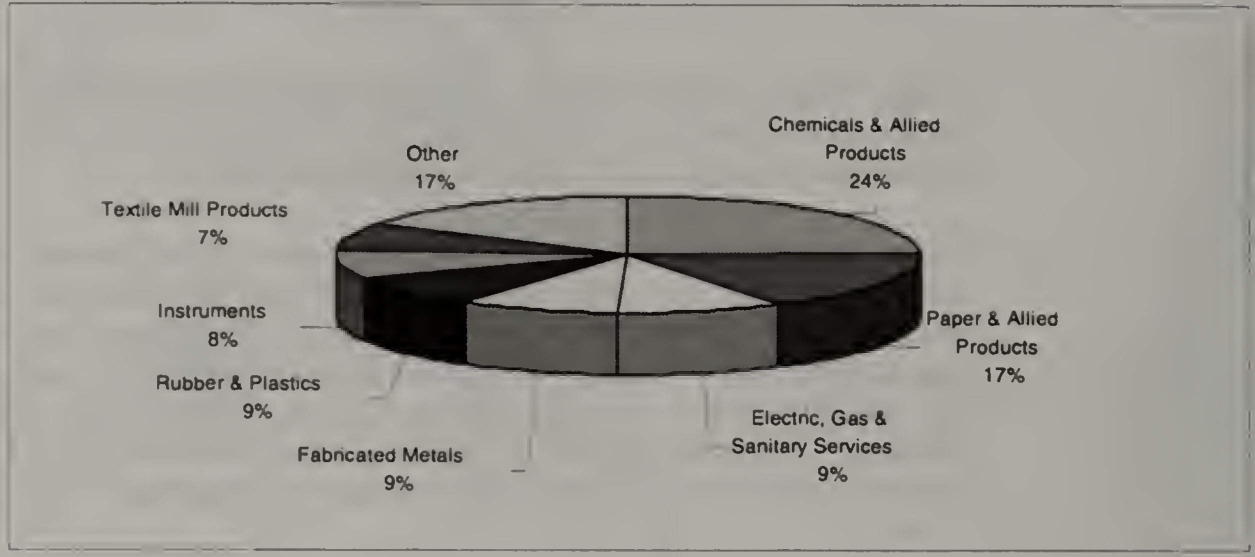


Figure 14 shows byproduct generation by industrial sector. While the Chemical and Allied Products sector accounted for 65% of total statewide use, this sector produced 24% of the total byproduct generated in 1999. In contrast, the Paper and Allied Products sector, which accounted for 3% of total statewide chemical use, accounted for 17% of the byproduct generated.

The Electric, Gas and Sanitary Services sector accounted for 9% of total byproduct generated. The Fabricated Metals sector accounted for 9% of total byproduct generated. Other major industries that generated byproduct include the Rubber and Plastics sector (9%), the Instruments sector (8%), and the Textile Mills Products sector (7%). The remaining 17% of byproduct was attributed to a variety of sectors.

Figure 15 shows TRI on-site releases to the environment. The Electric, Gas and Sanitary Services sector, which represented 5% of total statewide use, was the largest source of on-site releases, accounting for 42% of all on-site releases. This sector provides power and utilities for Massachusetts businesses and citizens. The Chemical and Allied Products sector, which represented 65% of total statewide use, accounted for 11% of total on-site releases. Paper and Allied Products also accounted for 11% of total on-site releases.

Figure 15 – 1999 TRI On-Site Releases (by industrial sector)

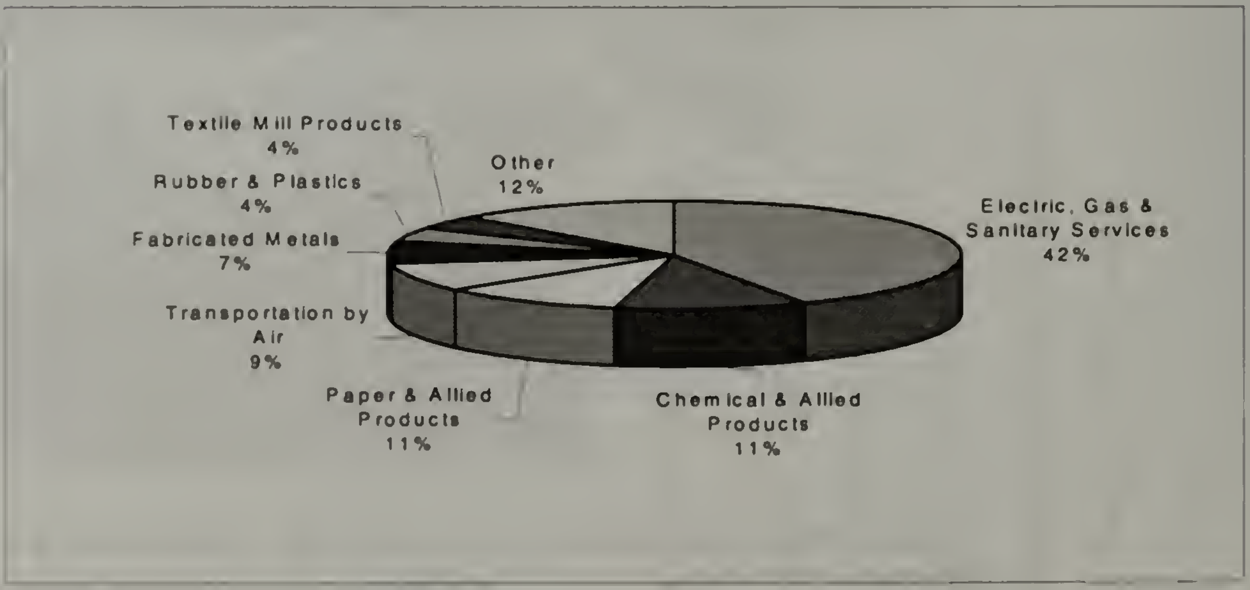
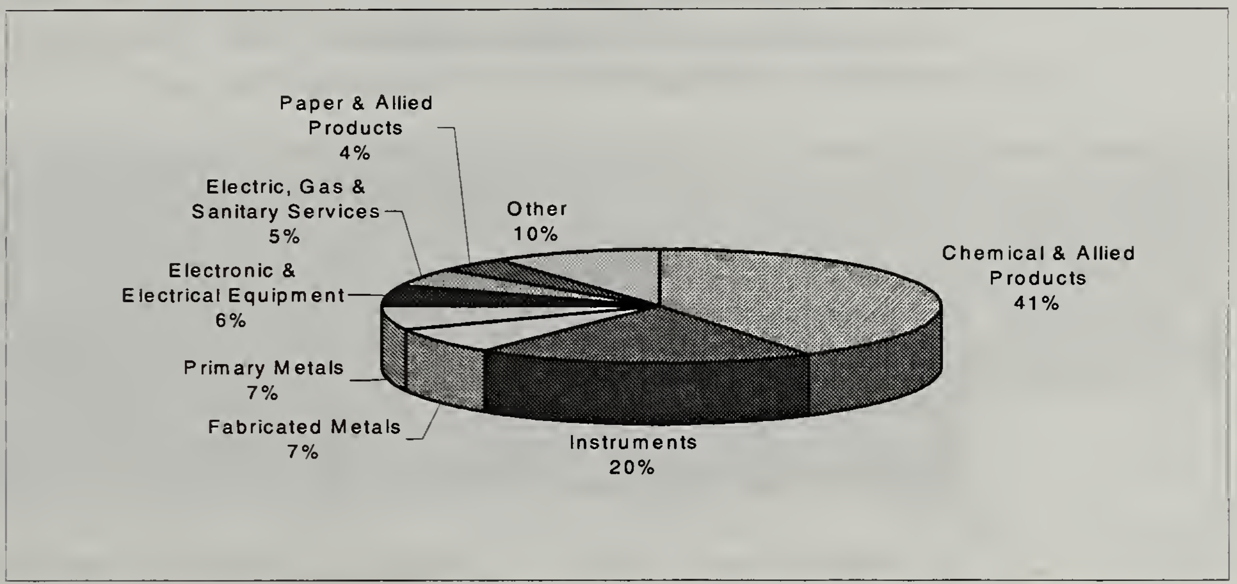
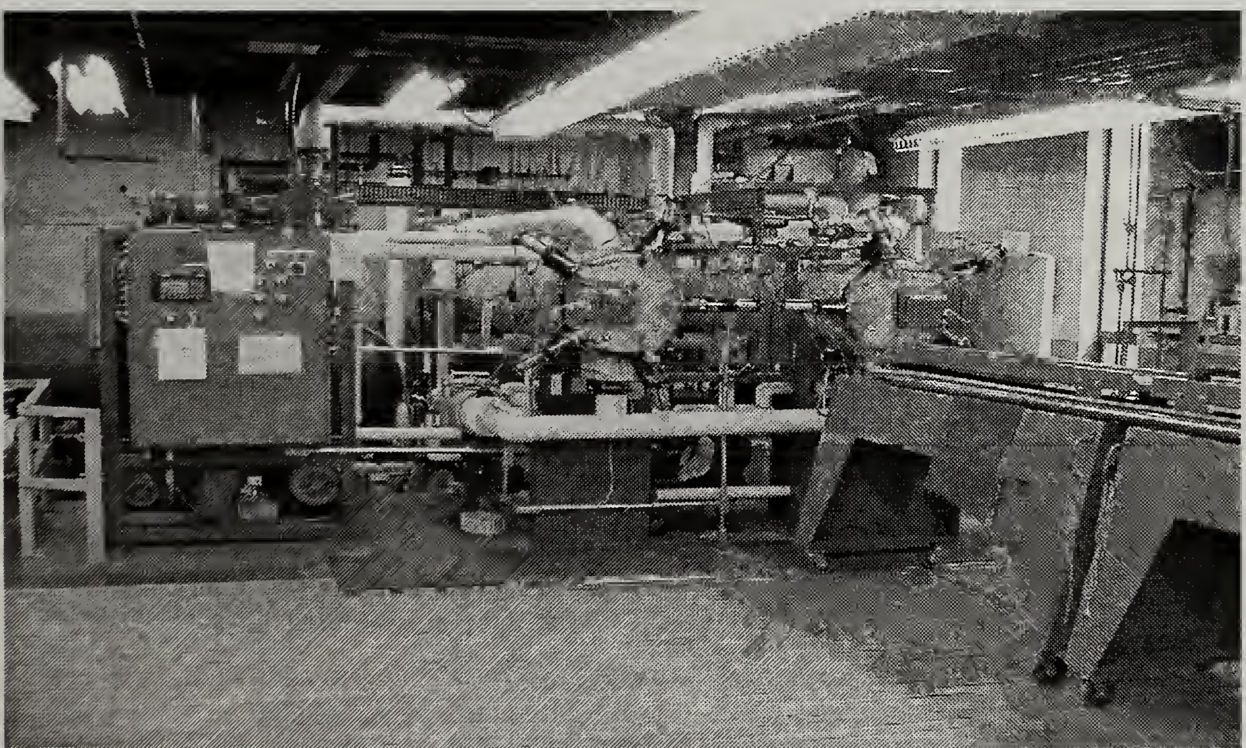


Figure 16 shows TRI transfers off-site by industrial sector. Two sectors, Chemical and Allied Products and Instruments, accounted for 41% and 20%, respectively, of transfers off-site. The third largest sectors in the category, the Fabricated Metals and Primary Metals sectors, each were responsible for 7% of transfers off-site.

Figure 16 – 1999 TRI Transfers Off-Site (by industrial sector)





(Stern-Leach, Attleboro MA) Stern-Leach has installed a vacuum degreasing cleaning system that has resulted in their use of TURA listed chemicals used for cleaning to fall far below reporting thresholds in 2000. Their use of just over 500,000 pounds of TURA listed chemicals is expected to be completely eliminated by converting to perchlorethlene and the vacuum degreaser, pictured above, from the previous trichorethylene cleaning technique. Their ammonia use will be eliminated once a hydrogen-nitrogen system is installed to create an atmosphere for treating of the metals during 2001.

IV. 1999 Major TURA Facilities

Table 4 lists the top 5 facilities that showed the largest byproduct reductions from 1998 to 1999, due to toxics use reduction.

While individual changes in production varied, these facilities either reported increased production or reported substantially more byproduct reduction than could be attributed to reduced manufacturing activity. Overall, the production level of this group of facilities showed an increase in production levels over 1998. Thus, these reductions are best attributed to toxics use reduction.

Table 4 - 1999 Top 5 Facilities with the Largest Reduction in Byproduct Generation While Implementing Toxics Use Reduction (1998-1999)

Company	Reduction in Byproduct (Lbs.)	Toxics Use Reduction Techniques Used
1. Rexam Image Products (South Hadley)	962,255	Production Unit Modernization, Input Substitution
2. Duro Finishing Corp. (Fall River)	350,999	Input Substitution
3. Foilmark (Newburyport)	217,714	Improved Operation and Maintenance
4. Sullivan Paper Co. (West Springfield)	203,299	Input Substitution
5. Polaroid (Norwood)	157,615	Improved Operation & Maintenance

Top 20 Facility Lists

Table 5 lists the 20 facilities that used the most chemicals and the 20 facilities that generated the most byproduct in 1999. The 20 facilities with the highest use used 937 million pounds, or 68% of total statewide use. The 20 facilities that generated the most byproduct generated 75 million pounds of byproduct, or 56% of total statewide byproduct.

Table 5 - 1999 Top 20 Facilities
(Largest Quantity of Total Use and Byproduct Generation)

Total Use *These quantities include Trade Secret*			Byproduct Generation *These quantities include Trade Secret*		
Facility Name	**Town**	**Total Use (Lbs.)**	**Facility Name**	**Town**	**Byproduct Generation (Lbs.)**
Nova Chemicals, Inc.	Springfield	307,769,530	Solutia, Inc.	Springfield	8,564,221
Solutia, Inc.	Springfield	153,529,415	Rexam Image Products	South Hadley	8,474,096
American Polymers	Oxford	76,997,470	Flexcon Co., Inc.	Spencer	7,333,053
Borden & Remington	Fall River	67,507,905	Chemdesign Corp.	Fitchburg	5,552,298
Elite New England	Ludlow	46,881,792	Eastman Gelatine Corporation	Peabody	4,880,017
Eastman Gelatine Corporation	Peabody	44,983,440	Texas Instruments	Attleboro	4,661,900
Holland Company, Inc.	Adams	42,430,762	Crane & Co., Inc. Pioneer Mill	Dalton	4,323,713
Astro Chemicals, Inc.	Springfield	26,611,664	Polaroid Corporation	Waltham	3,734,622
Sithe New England Holdings LLC	Everett	22,455,554	Kodak Polychrome Graphics LLC	Holyoke	3,365,862
USGEN New England Inc.	Salem	19,646,030	Bostik, Inc.	Middleton	3,121,481
Allegheny Rodney Strip Division	New Bedford	18,900,281	Globe Manufacturing	Fall River	2,867,806
Teknor Apex Co.	Attleboro	16,340,209	Allegheny Rodney Strip Division	New Bedford	2,644,857
Ashland Chemical Company	Tewksbury	14,698,374	Venture Tape	Rockland	2,462,310
Houghton Chemical Corp.	Boston	14,103,401	Southern Energy Canal LLC	Sandwich	2,441,774
Texas Instruments	Attleboro	12,547,000	Ideal Tape Company	Lowell	2,345,308
Monson Companies, Inc	Leominster	11,772,795	BBA Nonwovens Griswoldville Plant	Colrain	2,002,740
Omnova Solutions, Inc.	Fitchburg	10,579,311	Madico, Inc.	Woburn	1,812,999
Bostik, Inc.	Middleton	10,356,338	USGEN New England, Inc.	Somerset	1,557,000
Shipley Co., Inc.	Marlborough	9,696,080	Sanmina Corp.	Wilmington	1,488,860
Van Waters & Rogers	Salem	9,425,610	Cranston Print Works	Webster	1,468,646

Table 6 lists the 20 facilities that shipped the most chemicals in product and the 20 facilities that had the highest TRI releases and transfers. The 20 facilities with the highest quantity shipped in product shipped 282 million pounds in product, or 76% of total shipped in product statewide. The 20 facilities with the highest quantity of releases and transfers released and transferred 32 million pounds, or 61% of total releases and transfers statewide.

Table 6 – 1999 Top 20 Facilities
(Largest Quantity of Shipped in Product and TRI On-site Releases and Transfers Off-Site)

Shipped in Product *These quantities include Trade Secret*			TRI Releases and Transfers *These quantities include Trade Secret*		
Facility Name	Town	Shipped in Product (Lbs.)	Facility Name	Town	Releases and Transfers (Lbs.)
Borden & Remington	Fall River	67,379,477	Solutia, Inc.	Springfield	6,744,402
Solutia, Inc.	Springfield	37,388,840	Texas Instruments	Attleboro	4,631,766
Elite New England	Ludlow	30,993,632	Chemdesign Corp.	Fitchburg	3,564,230
Astro Chemicals, Inc.	Springfield	25,106,801	Polaroid Corporation	Waltham	2,978,018
Ashland Chemical Company	Tewksbury	14,698,374	USGEN New England Inc.	Somerset	1,371,922
Houghton Chemical Corp.	Boston	14,098,821	Clean Harbors Environmental Services, Inc.	Braintree	1,291,577
Monson Companies, Inc	Leominster	11,765,661	Holyoke Water Power Mount Tom Station	Holyoke	1,242,495
Van Waters & Rogers	Salem	9,388,874	USGEN New England Inc.	Salem	1,134,700
Shipley Co., Inc.	Marlborough	9,180,280	Delta Airlines	Boston	1,008,098
TACC International	Rockland	8,873,754	ISP Freetown Fine Chemicals Inc	Assonet	931,416
Allegheny Rodney Strip Division	New Bedford	7,987,890	Sanmina Corp.	Wilmington	918,140
Comtran Corp.	Northbridge	6,950,200	Ideal Tape Company	Lowell	894,530
Texas Instruments	Attleboro	6,588,000	Stahl USA	Peabody	871,874
Callahan Company	Walpole	5,324,003	Somerset Power LLC	Somerset	821,306
Spalding Sports Worldwide	Chicopee	5,124,104	Attleboro Refining Company, Inc.	Attleboro	704,294
Webco Chemical Corp.	Webster	4,989,826	The Duncan Group	Everett	654,066
Bostik, Inc.	Middleton	4,854,268	Southern Energy Canal LLC	Sandwich	632,273
Alphagary	Leominster	4,243,550	Rexam Image Products	South Hadley	601,493
Surface Coatings, Inc.	Wilmington	3,857,771	Flexcon Co., Inc.	Spencer	591,609
Savogran Company	Norwood	3,334,654	Kodak Polychrome Graphics LLC	Holyoke	583,801

V. 1999 Top 5 Chemicals

This section highlights the 5 most commonly used substances reported in Massachusetts under the TURA program, including information on each chemical's use, exposure routes, health effects, and fate in the environment. The five substances highlighted are: styrene, sodium hydroxide, hydrochloric acid, sulfuric acid, and methanol.

STYRENE

Styrene (also called vinyl benzene) is a flammable, oily liquid. It is clear to yellowish in color and has a strong odor. Styrene is not found in nature.

Styrene is produced in very large amounts to make plastics, synthetic rubber, resins, and insulators. Some styrene plastics are used in business machines, luggage, and in construction materials; others are used in automotive and household goods and in packaging material. Cigarette smoke and automobile exhausts contain small amounts of styrene.

In 1999, eleven TURA facilities (2% of total facilities) reported styrene monomer to the TURA program:

- 387,596,200 pounds used (28% of the total use reported, highest use of any chemical);
- 81,500 pounds generated as byproduct (less than 1% of the total generated as byproduct reported); and
- 1,625,000 pounds shipped in product (less than 1% of the total shipped in product reported);
- 80,900 pounds released or transferred (less than 1% of the total releases and transfers reported).

The amount of styrene monomer used in Massachusetts in 1999 was enough to fill 9,690 carrier trucks like the ones seen on our highways. The use of styrene monomer (non-production adjusted) has increased 2% since 1990 (approximately 8,000,000 pounds) or by 191 carrier trucks each year.

While styrene monomer was the highest volume TURA chemical used in Massachusetts, a relatively small amount of byproduct was generated. This is largely due to the efficiency of the process by which styrene monomer is turned into plastic polymers. For styrene monomer, byproduct as a percent of total use is less than 1%, reflecting efficiency in use of greater than 99%.

Exposure to styrene can occur in the workplace, as well as in the environment following releases to air, water, land, or groundwater. Exposure can also occur when people breathe air contaminated with cigarette smoke or automobile exhaust, or consume food or water contaminated with styrene. Styrene is less likely to be absorbed through skin contact. Styrene does not remain in the body for a long period of time.

Styrene evaporates when exposed to air, but dissolves only slightly when mixed with water. Most releases of styrene to the environment are to air; once in air, styrene breaks down to other chemicals. Microorganisms that live in water and in soil can also break down styrene. Because it is a liquid that does not bind well to soil, styrene can move

through the ground and enter groundwater. Plants and animals are not likely to store styrene in their tissue.

Styrene vapor can irritate the eyes, the nose, and the throat. Styrene vapor can also adversely affect the human nervous system, causing adverse eye effects. However, these effects are not likely to occur at levels of styrene that are normally found in the environment. Human health effects associated with breathing small amounts of styrene over long periods of time in the workplace include alterations in vision, hearing loss, and decreased reaction times. Other human health effects associated with these types of exposures are not known. EPA is currently reviewing the potential for styrene to cause cancer in humans, and to affect reproduction. Long-term animal exposures to high styrene levels has resulted in liver damage; however, this effect as not been seen in humans.

SODIUM HYDROXIDE

Sodium hydroxide is a white, odorless solid that is used in water solutions in a wide range of industrial and chemical processes. Water-based solutions of sodium hydroxide are known as soda lye.

Sodium hydroxide is used to neutralize acids, make sodium salts, rayon, plastics, paper, and cellophane, in reclaiming rubber, and in the manufacture of laundering, bleaching, and dishwashing materials.

Exposure to sodium hydroxide can occur in the workplace or in the environment following releases to air, water, land, or groundwater.

In 1999, 219 facilities (45% of total facilities) reported sodium hydroxide to the TURA program:

- 89,651,300 pounds used (6% of the total use reported, #2 in reported use);
- 15,531,600 pounds generated as byproduct (11% of the total byproduct reported, highest byproduct reported); and
- 38,337,400 pounds shipped in product (10% of the total shipped in product reported, #1 in reported shipped in product);
- 1,181,000 pounds released or transferred (2% of the total releases and transfers reported, #18 in reported releases and transfers).

The amount of sodium hydroxide used in Massachusetts in 1999 was enough to generate 448,300,000 gallons of bleach. The use of sodium hydroxide (non-production adjusted) has increased by 5% since 1992 (approximately 4,000,000 pounds) or by 21,000,000 gallons of bleach.

Small quantities of sodium hydroxide will slightly raise the pH of water in aquatic ecosystems, but larger quantities can raise the pH for extended periods of time. Sodium hydroxide is highly soluble in water and, when dissolving, generates considerable heat. Sodium hydroxide is very toxic to aquatic life at high levels; effects may include the death of animals, birds, or fish, and death or low growth rate in plants.

Breathing sodium hydroxide can irritate the mouth, nose, and throat. Exposure to higher levels may irritate the lungs, causing coughing and/or shortness of breath. Still higher exposure can cause a buildup of fluid in the lungs (pulmonary edema), causing death. Sodium hydroxide is a corrosive solid or liquid and can cause severe burns of the eyes and skin on contact. It has not been tested for its ability to cause cancer, nor has it been tested for its ability to adversely affect reproduction.

HYDROCHLORIC ACID

Hydrochloric acid is also known as hydrogen chloride. Hydrochloric acid occurs as a colorless, nonflammable liquid or gas with an irritating, pungent odor.

Hydrochloric acid is used in the production of chlorides, for refining ore in the production of tin and tantalum, for pickling and cleaning of metal products, in electroplating, in removing scale from boilers, for the neutralization of basic systems, as a laboratory reagent, as a catalyst and solvent in organic syntheses, in the manufacture of fertilizers and dyes, for hydrolyzing starch and proteins in the preparation of various food products, and in the textile and rubber industries. Hydrochloric acid also is emitted during incineration, and during petroleum refining. It is used to maintain pH balance in swimming pools, spas, etc. It also is registered as an antimicrobial, a bactericide, and a fungicide. Hydrochloric acid is used as a general antimicrobial to disinfect bathrooms, kitchens and food preparation areas, and other areas in commercial and industrial buildings, hospitals, nursing homes, and in and around household dwellings.

In 1999, 77 facilities (16% of total facilities) reported hydrochloric acid to the TURA program:

- 49,978,000 pounds used (4% of the total use reported, #3 in reported use);
- 6,021,100 pounds generated as byproduct (4% of the total byproduct reported, #7 in reported generated as byproduct);
- 4,626,000 pounds shipped in product (1% of the total shipped in product reported); and
- 3,809,000 pounds released or transferred (7% of the total releases and transfers reported, #3 in reported releases and transfers).

The amount of hydrochloric acid used in Massachusetts in 1999 was enough make 62,472,040 gallons of disinfectant. The use of hydrochloric acid (non-production adjusted) has increased by 6% since 1991 (approximately 3,000,000 pounds) or by 3,340,008 gallons of disinfectant.

Exposure to hydrochloric acid can occur in the workplace or in the environment following releases to air, water or groundwater.

Hydrochloric acid released into the atmosphere as a gas will be readily incorporated into clouds, rain, and fog. Hydrochloric acid is also soluble in alcohol, benzene, methanol, ethanol, and ether. It is incompatible with most metals.

Hydrochloric acid is corrosive to the eyes, skin, and mucous membranes. Short-term inhalation exposure may cause coughing, hoarseness, inflammation and ulceration of the respiratory tract, chest pain, and pulmonary edema. Short-term oral exposure may cause corrosion of the mucous membranes, esophagus, and stomach, with nausea, vomiting, and diarrhea. Skin contact may produce severe burns, ulceration, and scarring.

Long-term occupational exposure to hydrochloric acid has been reported to cause gastritis, chronic bronchitis, dermatitis, and photosensitization in workers. Prolonged exposure to low concentrations may also cause dental discoloration and erosion. Hydrochloric acid has not been classified with respect to potential carcinogenicity, nor has it been tested for its ability to adversely affect reproduction.

SULFURIC ACID

Sulfuric acid is a clear, colorless, oily liquid made in large volumes for commercial use. It is highly reactive, corrosive, and is an explosion hazard.

Sulfuric acid is used to make fertilizers, dyes, textile fibers, explosives, petroleum products, alcohols, pulp and paper, detergents, and other chemicals. It also is used as a leaching agent for ores, a pickling agent for iron and steel, and is a component of lead storage batteries.

In 1999, 150 facilities (31% of total facilities) reported sulfuric acid to the TURA program:

- 43,916,400 pounds used (3% of the total use reported, #4 in reported use);
- 13,601,500 pounds generated as byproduct (10% of the total byproduct reported amount, #2 in reported generated as byproduct);
- 5,759,800 pounds shipped in product (1% of the total shipped in product reported, #15 reported in shipped in product); and
- 920,300 pounds released or transferred (2% of the total releases and transfers reported, #17 in reported releases and transfers).

The amount of sulfuric acid used in Massachusetts in 1999 was enough to make 3,513,312 automobile batteries. The use of sulfuric acid (non-production adjusted) has not changed significantly since 1990.

Exposure to sulfuric acid can occur in the workplace or in the environment following releases to air, water, land, or groundwater.

Sulfuric acid has a great affinity for water. It may enter the environment from industrial discharges or spills. Acute (short-term) toxic effects may include the death of animals, birds, or fish, and death or low growth rate in plants. Acute effects are generally seen two to four days after animals or plants come in contact with a toxic chemical substance. Sulfuric acid has moderate acute toxicity to aquatic life. Sulfuric acid is very corrosive and would badly burn any plants, birds, or land animals exposed to it.

Chronic (long-term) toxic effects may include shortened lifespan, reproductive problems, lower fertility, and changes in appearance or behavior. Chronic effects can be seen long after exposure to a toxic chemical begins. Based on limited human data, the International Agency of Research on Cancer (IARC) believes there is sufficient evidence to state that occupational exposures to strong inorganic mists containing sulfuric acid is carcinogenic to humans.

Sulfuric acid can severely burn the skin and eyes causing permanent damage. Exposure to mist can irritate the eyes, nose, throat, and lungs, causing coughing, chest tightness and sneezing. Higher levels can cause a buildup of fluid in the lungs (pulmonary edema). Repeated exposures can cause permanent lung damage and damage teeth.

Chronic health effects can occur a long time after exposure and can last for months or years. EPA has not tested sulfuric acid for its ability to cause cancer in animals or its ability to adversely affect reproduction. In general, repeated exposure can cause bronchitis, with cough, phlegm, and shortness of breath, and may cause emphysema. Sulfuric acid also can cause chronic runny nose, tearing of the eyes, nosebleeds, and stomach upset.

METHANOL

Methanol (also known as methyl alcohol and wood alcohol) is a colorless liquid with a strong odor that may explode when exposed to open flame. It occurs naturally in wood and in volcanic gases. Methanol also is a product of decaying organic material.

Methanol is used in a variety of industrial applications. It is used in the production of formaldehyde, acetic acid, chloromethanes, methyl methacrylate, methylamines, dimethyl terephthalate. Companies use methanol as a solvent or antifreeze in the manufacturing of paint stripper, aerosol spray paints, wall paints, carburetor cleaners, and car windshield washer compounds. It is used in the packaging and repackaging of chemicals, as a solvent in the quality testing of pharmaceutical products, and in the treatment of wastewater. Methanol is also a gasoline additive, and in some cases, a gasoline substitute for use in automobiles and other small engines. It is considered an ideal hydrogen carrier for fuel cell vehicles.

In 1999, 50 facilities (10% of total facilities) reported methanol to the TURA program:

- 40,205,800 pounds used (3% of the total use reported, #5 in reported use);
- 5,719,100 pounds generated as byproduct (4% of the total byproduct, #9 in reported generated as byproduct);
- 34,524,600 pounds shipped in product (9% of the total shipped in product reported, #2 in reported shipped in product);
- 2,519,600 pounds released or transferred (5% of the total releases and transfers reported, #5 in reported releases and transfers).

Exposure to methanol can occur in the workplace or in the environment following releases to air, water, land, or groundwater. Methanol releases are primarily to the atmosphere. It contributes to the formation of photochemical smog when it reacts with other volatile organic carbon substances in air. However, approximately 20% of methanol releases are direct discharges to the soil, groundwater or surface water.

In the home or workplace, exposure can occur when people use certain paint strippers, aerosol spray paints, wall paints, windshield wiper fluid, and small engine fuel. Methanol enters the body when breathed in with contaminated air or by passing through the skin. Breathing methanol can irritate the nose, mouth, and throat, causing coughing and wheezing. Repeated or prolonged exposure can cause dryness and cracking of the skin. Workers repeatedly exposed to methanol have experienced effects ranging from headaches, sleep disorders, and gastrointestinal problems, to optic nerve damage.

The effects of drinking even small amounts of methanol range from headaches to a lack of coordination similar to that associated with drunkenness. Delayed effects such as severe abdominal, leg, and back pain can follow the inebriation effects of methanol. People have died from drinking large amounts of methanol. Methanol is classified as a Teratogen, a chemical that might interfere with the normal development of the fetus and result in the loss of a pregnancy, a birth defect, or a pregnancy complication.

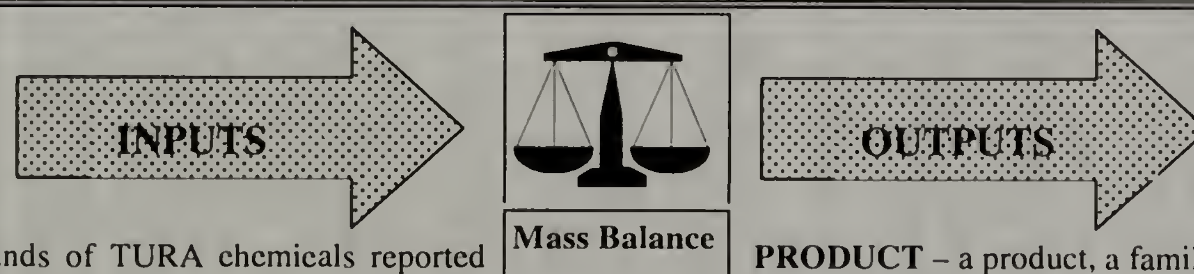
Methanol use is expected to increase exponentially with the demand for fuel cell technology for transportation. Given this expected increase in the production, transportation, storage, and use of methanol, the potential for accidental releases to the environment will increase. Because it is a liquid that does not bind well to soil, methanol that makes its way into the ground can enter groundwater. However, methanol will dissolve and dilute to very low concentrations in the event of a surface water spill. Similarly, groundwater methanol concentrations will likely fall to low levels once complete dissolution has occurred.

VI. Key TURA Terms

This section contains the definitions of key TURA terms. Additional information regarding TURA and TRI, as well as general chemical information, can be obtained from the Internet web sites noted on the next page.

TURA – Massachusetts Toxics Use Reduction Act of 1989 (MGL 21I)
TRI – federal EPA Toxics Release Inventory
TRADE SECRET – the information identified as confidential by TURA filers. To protect confidentiality claims by Trade Secret filers, all trade secret data in this information release is presented in aggregated form. Aggregated data does not include the names and amounts of chemicals subject to claims of confidentiality.

The terms and definitions below have been arranged in order of <u>inputs</u> and <u>outputs</u>. Chemicals that are used by companies are brought into the facility and are manufactured, processed or otherwise used. As a result of <u>using</u> these chemicals, a company has <u>outputs</u> that can include a product that is created for sale, or a byproduct or waste. The calculation of use and waste of chemicals is known as 'Mass Balance'. Generally the inputs equal the outputs, but there are circumstances where a chemical is used in ways that result in an imbalance between inputs and outputs. These circumstances are most often the result of: 1) chemicals are recycled on-site, 2) the product was held in inventory, 3) chemical is consumed or transformed, or 4) the chemical is a compound.

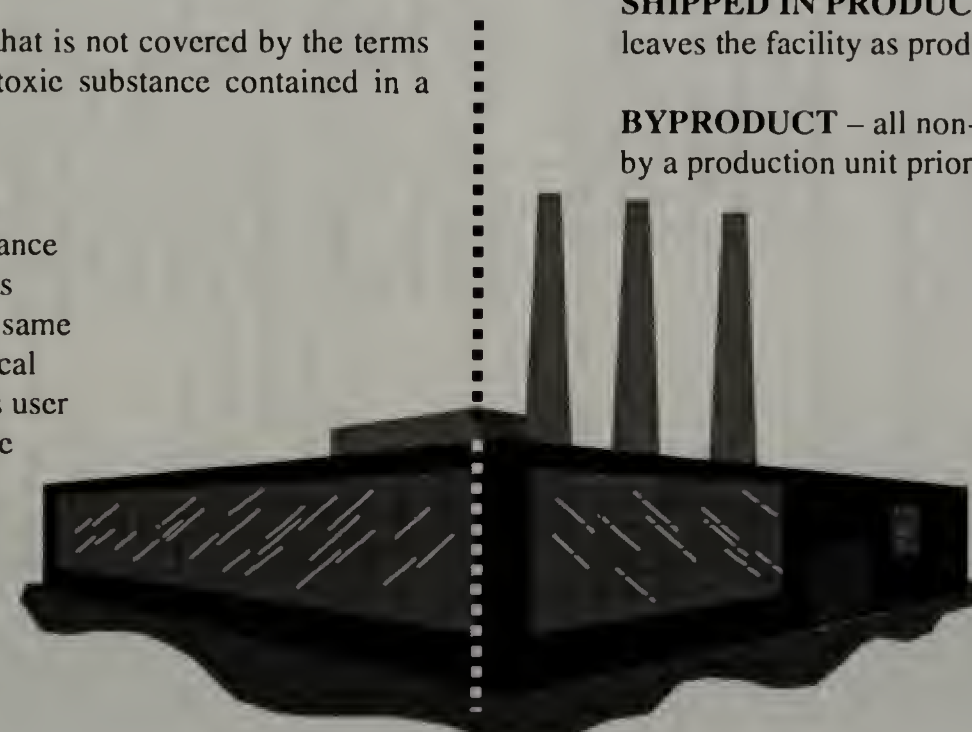


TOTAL USE – the total quantity in pounds of TURA chemicals reported manufactured, processed and otherwise used.

MANUFACTURE – to produce, prepare, import or compound a toxic or hazardous substance.

OTHERWISE USE – any use of a toxic substance that is not covered by the terms "manufacture" or "process" and includes use of a toxic substance contained in a mixture or trade name product.

PROCESS – the preparation of a toxic or hazardous substance, including without limitation, a toxic substance contained in a mixture or trade name product, after its manufacture, for distribution in commerce: a) in the same form or physical state, or in a different form or physical state, from that in which it was received by the toxics user so preparing such substance; or b) as part of an article containing the toxic or hazardous substance.



PRODUCT – a product, a family of products, an intermediate product, family of intermediate products, or a desired result or a family of results. "Product" also means a byproduct that is used as a raw material without treatment.

SHIPPED IN PRODUCT – the quantity in pounds of the chemical that leaves the facility as product.

BYPRODUCT – all non-product outputs of reportable substances generated by a production unit prior to handling, treatment, and release.

ON-SITE RELEASES– all byproducts that are released to the air, discharged to surface waters, released to land and underground injection wells.

TRANSFERS OFF-SITE – byproducts that are transferred off-site for energy recovery, recycling, treatment and disposal.

RELEASES AND TRANSFERS – total on-site releases and transfers off-site as defined under TRI.

The Following Web Sites Contain Information Regarding Chemicals, TURA and Pollution Prevention:

TURAData

A community guide to toxics information from Massachusetts' Toxics Use Reduction Act

http://www.turi.org/turadata/index.html

MASSACHUSETTS Department of Environmental Protection

Toxic Use Reduction Program, Massachusetts DEP
http://www.state.ma.us/dep/bwp/dhm/tura

TOXICS USE REDUCTION INSTITUTE

Toxic Use Reduction Institute (TURI)
http://www.turi.org

OTA online
Commonwealth of Massachusetts
Executive Office of Environmental Affairs
Office of Technical Assistance

Office of Technical Assistance for Toxics Use Reduction (OTA)
http://www.state.ma.us/ota

Agency for Toxic Substances and Disease Registry
http://atsdr1.atsdr.cdc.gov:8080/ToxProfiles/

CambridgeSoft Chemfinder gives basic physico-chemical data and molecular structures for chemicals, and provides links to international data sources addressing specific chemicals.
http://chemfinder.camsoft.com/

Envirofacts, US EPA
http://www.epa.gov/enviro/html/emci/chemref/index.html

Environmental Chemicals Data and Information Network (ECDIN)
http://ecdin.etomep.net/

Environmental Defense Fund (EDF) Scorecard
http://www.scorecard.org/chemical-profiles/

Global Information Network on Chemicals (GINC)
http://db.nihs.go.jp/

Integrated Risk Management Information System (IRIS) is a database of human health effects that may result from exposure to various substances found in the environment US EPA
http://www.epa.gov/iris/

TOXLINE. Free access to the National Library of Medicine's toxicology-specific database of abstracts, reference journal articles.
http://www.medscape.com/misc/FormToxlineInfLive.html

University of Akron Hazardous Chemicals Database provides physical data on chemicals and links to Department of Transportation safety guides that are valuable for emergency response
http://ull.chemistry.uakron.edu/erd/

Massachusetts Department of
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One Winter Street
Boston, MA 02108-4746

Commonwealth of Massachusetts
Jane Swift, Governor

Executive Office of Environmental Affairs
Bob Durand, Secretary

Department of Environmental Protection
Lauren A. Liss, Commissioner